DISSERTATION

ON

STUDY OF CARDIOVASCULAR MANIFESTATIONS IN HYPERTHYROIDISM

Dissertation submitted to

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CERTIFICATE

This is to certify that this dissertation entitled " **DISSERTATION ON THE STUDY OF CARDIOVASCULAR MANIFESTATIONS IN HYPERTHYROIDISM."** is the bonafide original work of **Dr. A.B. RAJASEKAR** in partial fulfilment of the requirements for M.D Branch -I (General Medicine) Examination of the Tamilnadu Dr. M.G.R. Medical University to be held in APRIL - 2013. The period of study was from October- 2011 to November - 2012.

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DECLARATION

I, **Dr. A.B. RAJASEKAR**, solemnly declare that the dissertation titled **"DISSERTATION ON THE STUDY OF CARDIOVASCULAR MANIFESTATIONS IN HYPERTHYROIDISM"** is a bonafide work done by me at Thanjavur Medical College, Thanjavur during October 2011 to November 2012 under the guidance and supervision of **Prof. Dr. D. NEHRU,M.D.,DMRD.,** Unit Chief M-VI, Thanjavur Medical College, Thanjavur.

This dissertation is submitted to Tamilnadu Dr. M.G.R Medical University towards partial fulfillment of requirement for the award of **M.D. Degree (Branch -I) in General Medicine**.

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STUDY OF CARDIOVASCULAR MANIFESTATIONS IN HYPERTHYROIDISM

ABSTRACT

BACK GROUND AND OBJECTIVE:

Thyroid disorders are the most common among all the endocrine diseases in India. Hyperthyroidism (thyrotoxicosis) is widely prevalent in India in the age group of 16-23 years, women affected ten times more than men.Thyroid hormone directly affect the heart and peripheral vascular system causing increased heart rate and cardiac output .Atrial arrhythmias,congestive cardiac failure and rarely Valvular lesion occur in Thyrotoxicosis. Hyperthyroidism results in increased mortality due to circulatory disease and dysrhythmias. Incidence of cerebral embolism more common in hyperthyroidism with Atrial fibrillation occurring in elderly and Anticoagulation is indicated in them.Early treatment results in reversion to sinus rhythm in upto 2/3 of the patients.Beta-blockers reduce left ventricular hypertrophy andatrial and ventricular arrhythmias in patients with hyperthyroidism.

METHODOLOGY:

Seventy patients full filling the study criteria were recruited in this study.

RESULTS:

Study included 60 females and 10 males in the ratio of 6:1.Incidence of Hyperthyroidism is more common in the age group of 30-49yrs.commonest symptoms were Palpitation(79%) , Heat intolerance (69%)Fatigue(66%)tremor in hands(11%),weight loss(50%). Signs are Tachycardia(80%),increased Blood pressure and Pulse pressure, ECG and ECHO shows Sinus tachycardia(80%), Atrial fibrillation(17%) ,Chamber enlargement(13%)(14%) had Mitral regurgitation and (3%) had Mitral valve Prolapse.Chest x ray PA view shows (20 %) had Cardiomegaly in our study.

INTERPRETATION AND CONCLUSION:

Thyrotoxicosis was common in the Third decade of life.Females were more commonly affected than males. Cardiovascular symptoms were palpitations, dyspnea, chest pain and signs were tachycardia,widened pulse pressure andpedal edema.Chest X-ray showed Cardiomegaly.ECG changes were sinus tachycardia, Atrial fibrillation. Echocardiogram showed chamber enlargement, Mitral regurgitations and Mitral valve prolapse. In our study younger patients were more

affected with hyperthyroidism(thyrotoxicosis) with Cardiac manifestations.Patients were improved wellafterearly diagnosis and treatment in our study.

KEYWORDS:

Hyperthyroidism, Palpitation, Arrhythmias, congestive cardiac failure ,valvularlesion, anticoagulation, Betablockers,.

CONTENTS

ABBREVIATIONS

AF- Atrial fibrillation

AR- Aortic regurgitation

CCF – Congestive Cardiac Failure

CM- Cardiomegaly

CVS-Cardio vascular system

CF- Cardiac failure

D - Digoxin

DD- Diastolic dysfunction

DNA – Deoxy ribo Nucleic Acid

ECG – Electrocardiogram

ECHO - Echocardiogram

EDM- Early diastolic murmur

ESM- Ejection systolic murmur

FNAC – Fine needle Aspiration cytology

GD- Grave's disease

KI-Potassium iodide

LAE-Left Atrial enlargement

LV – Left ventricle

LVH- Left ventricular hypertrophy

MVP – Mitral valve Prolapse

MHC – Myosin heavy chain

MNG- Multinodular goiter

MR- Mitral regurgitation

NSR – Normal Sinus Rhythm

OPD – Out Patient Department

PSM - Pansystolic murmur

PAH -Pulmonary hypertension

RNA – Ribo Nucleic Acid

SA node-Sino Atrial node

SHT – Systemic Hypertension

SVT – Supraventricular Tachyarrhythmia

SVR – Systemic vascular resistance

T3/T4 - Thyroid hormones

T3 – Triiodothyronine

T4 – Thyroxine

TSH – Thyroid Stimulating Hormone

TFT – Thyroid Function Test

TPO – Thyroid Peroxidase Antibodies

TR – Thyroid receptor

TR- Tricuspid regurgitation

WPP-Wide PulsePressure

INTRODUCTION:

Thyroid means (Greek thyreos means Shield, plus eidos, form) Thyroid disorders is the commonest endocrinological disorder in clinical practice after diabetes mellitus. Hyperthyroidism is defined in a state of excessive thyroid gland function. Thyrotoxicosis is defined as the state of thyroid hormone excess and causes clinical Cardiac, Neurological, Ophthalmological , Dermatological, Gastro- intestinal , Endocrinological symptoms and signs. Hyperthyroidism caused by Grave's disease, Multi nodular goiter and Toxic adenomas constitute about majority of the cases of thyrotoxicosis. Grave's disease accounts for about 60-80% cases of thyrotoxicosis[1].

Thyroid hormone exerts wide spectrum Physiological, Bio chemical effects on Multi organ system functions. The clinical presentation depends on the disease of duration, severity, age to the hormone levels in blood [1].

Hyperthyroidism causes a wide range of clinical manifestations signs and symptoms. They include general features like hyperactivity, heat intolerance, easy fatigability, weight loss and neurological, cardiac, dermatological, ophthalmological, gastrointestinal and endocrinological manifestations.

Heart is mainly affect as T3, T4 has major effects on the Cardiovascular function and hemodynamics produce after significant derangement in function. Hyperthyroidism which is associated with tachycardia, increased LV workload,

SVT like AF. The common presentation of hyperthyroidism include tachycardia, wide pulse pressure, atrial fibrillation, brisk pulses, loud first heart sound and a hyper dynamic cardia apex[4,5].

In hyperthyroidism patients Cardiac involvement is of great prognostic importance and causes significant morbidity and mortality. All the more affected patients are potentially reversible also with early diagnosis and appropriate treatment. Secondary complications like cerebral stroke can be associated arise from atrial fibrillation[58]. Cardiac problems resolves rapidly, when hyperthyroidism is treated with anti thyroid drugs and thyroid hormone return to normal level. Early and prompt diagnosis of cardiac symptoms and signs and early appropriate treatment prevents most of the complications of hyperthyroidism. In addition to that most of the cardiac features are the presenting symptoms and signs of hyperthyroidism and thyrotoxicosis. Early diagnosis of the cardiac features is also not a difficult issue. Good clinical examination, an Electrocardiogram and an Echocardiogram are the essential requirements for early diagnostic modality for cardiac abnormalities.

Knowledge of cardiac manifestations of hyperthyroidism is difficult for early diagnosis of hyperthyroidism as well as the early prompt recognition of its clinical complications. An individual susceptibility to excess thyroid hormone is an important factor determining the clinical manifestations, there may be most of genetic and regional variations can occur.

Hence a study of local population is needed. The present study was undertaken because of study of the cardiac manifestations like symptoms and signs of hyperthyroidism and their correlation with thyroid hormone levels and with the outcome of treatment and follow up period for six months.

OBJECTIVES

AIMS OF THE STUDY:

1. To assess the biochemical, clinical, cardiac profile of cases with hyperthyroidism

2. To correlate the thyroid hormones levels with severity of clinical symptoms and correlations.

3. To compare the clinical outcomes after treatment and follow up period after six months of treatment.

REVIEW OF LITERATURE:

Robert J. Graves (1796-1853) described about “four cases of severe palpitation in females with thyrotoxicosis”.

C. von Basedow , described in 1840 three cases with goiter, exophthalmos and palpitation in the European continent and also noted the cardiac aspects of hyperthyroidism

Barbisan J.N et al have found high prevalence of acute atrial fibrillation in patients with hyperthyroidism and described that T3, T 4, TSH estimation is mandatory[74].

In Hyperthyroidism patients have Atrial fibrillation incidence about 9-22%[34]. In general population prevalence of 0.4 - 4%.

In Hyperthyroidism most responsive and most sensitive organ is heart and thyroid hormone exerts effects on cardiovascular system by various Physiological and Biochemical and Nuclear Receptor actions.

In hyperthyroidism , Cardiovascular manifestations which include palpitations, angina, fatigue, systolic hypertension and congestive cardiac

failure .For that 40% of patients have sinus tachycardia and 15% of patients have atrial fibrillation[34].

In Hyperthyroidism Other clinical manifestations include a Pulse: High sleeping pulse rate, high volume collapsing pulse water hammer in nature due to wide pulse pressure, Carotid dance and Suprasternal pulsations, Apex: hyper dynamic normal in position, First and pulmonary second heart sound and Third sound due to tachycardia.

The recurrence of MVP/MR is increased when associated with hyperthyroidism[47]. Systolic murmur at the Apex due to increased blood flow.

Means-Lerman scratch- To and Fro scratchy sound is heard in the Pulmonary area in Mid systole due to Rubbing of pleura and pericardium as a result of Hyperkinetic circulatory state in Hyperthyroidism[34].

Hyperthyroidism present as Palpitation with sweating, Angina pectoris and Dyspnea with congestive cardiac failure indicating that changes in cardiovascular system hemodynamics[32,33].

Cardio vascular system may be the primary indication of thyroid dysfunction in all symptomatic patients with cardiovascular disease.

Thyrotoxicosis is most commonly produces high cardiovascular disability and mortality. Primarily due toPalpitations,Atrial fibrillation, Diastolic dysfunctions, Congestive cardiac failure, thromboembolism and Stroke[58]. Clinically patients with palpitations, dyspnea on exertion, exercise intolerance and other cardiovascular manifestation. Sinus tachycardia is the most common initial cardiovascular signs; one should suspect possibility of Thyrotoxicosis.

Arrhythmia associated with hyperthyroidism and thyrotoxicosis includes atrial fibrillation and atrial premature contractions. Very rarely presented with ventricular tachycardia and ventricular fibrillation.

All cases with AF is the indication of evaluation of Hyperthyroidism and Thyrotoxicosis Zargar A.H. et al in their study "Clinical and endocrine aspects of thyrotoxicosis and its cardiovascular complications in 203 subjects found sinus tachycardia in 63.5% of patients. The other cardiac manifestations were atrial fibrillation (8.9%). Cardiomegaly (9.8%), Cardiac failure (7.4%) and left ventricular hypertrophy (5.4%). Various types of heart block were observed in 2.5% of patients.11% of patients had tachycardia as the most common cardiac manifestation[75].

Anatomy of Thyroid gland:

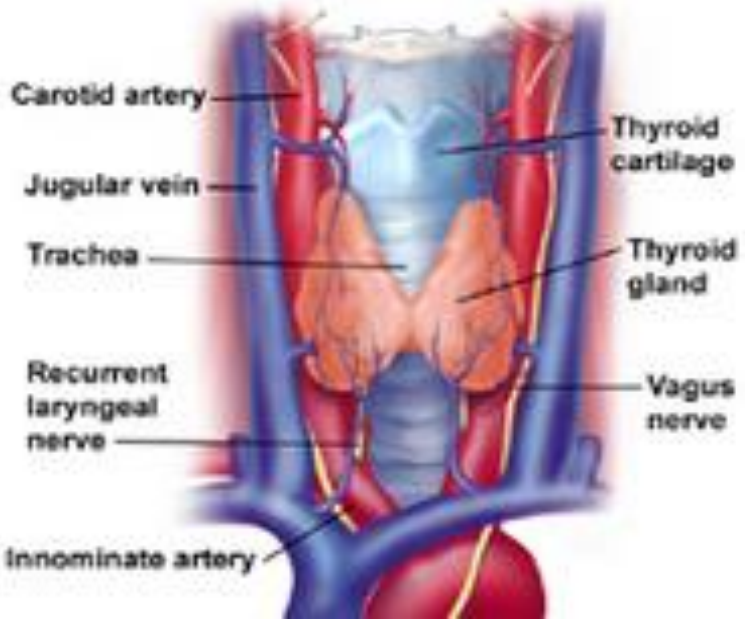


Figure1:

'Thyroid Gland (Glandula Thyreiodea) is a highly vascular organ and situated at Front and sides of the neck. It consists of right and left lobes connected across the Midline by a narrow portion called isthmus. Its weight is usually about 30 grams. It is slightly heavier in the female and increased in size during menstruation and Pregnancy.

Development of thyroid gland:

The thyroid gland is developed from a median diverticulum , which appears on the 4th Week on the summit of the tuberculum impar, but later is found in the furrow Immediately behind the tuberculum. It grows downward and backward as a tubular duct, then bifurcates and subsequently subdivides into a series of cellular cords, from

which the isthmus and lateral lobes of the thyroid gland are developed. The ultimo-branchial bodies from the 5th pharyngeal pouches are enveloped by the lateral lobes of the thyroid gland, they undergo atrophy and do not form true thyroid tissue. The connection of the diverticulum with the pharynx is termed the thyroglossal duct**;** its continuity is subsequently interrupted and it undergoes degeneration, it's upper end being represented by the foramen cecum of the tongue and its lower by the Pyrimidal lobe of thyroid gland.

Physiological functions of thyroid:

The thyroid gland is the most important Endocrine organ produces two vital hormones namely T3/T4 which is important for all cell metabolism in the body, cell growth and differentiations during intrauterine life and development. Thyroid hormones acting through nuclear receptors, these thyroid hormones in addition help to maintains thermo genic and metabolic homeostasis in all human beings. Disorders of thyroid gland can be primarily divided into Disorder of excessive thyroid gland function (Hyperthyroidism), Excessive productions of thyroid hormones (Thyrotoxicosis) and low productions of thyroid hormones (Hypothyroidism). Hyperthyroidism denotes excessive thyroid function. Hyperthyroidism most commonly caused by Grave's disease, MNG and Thyroid adenomas associated with thyrotoxicosis. Grave's disease constitute about 60-80% of thyrotoxicosis.[1]

Molecular Background:

The thyroid gland produces a proactive molecule namely T4 which is converted to T3 by iodination. The T3 exerts action by binding to nucleic acid receptor and producing physiological response.

Thyroid Hormone Related Receptors action:

These receptor belonging to nuclear receptor super family (analogues to Vitamin D3receptor and Retinoic acid receptor).this receptor encoded by TR alpha(alpha 1&2) and TR beta genes. The ligand binds to the non –histone protein portion of the DNA mostly in the carboxy terminal to bring about increase in mRNA, r RNA productions and related effects. The T3 receptor binds as homo or heterodimers on nucleic acid. The ligand binding domain confers specificity for T3 and mutation in these can lead to hormone resistance. Heptad motifs important for dimeric interaction. The TR alpha is clinically more significant than TR beta, it's mostly expressed on gastro-intestinal system, reproductive system, cardiovascular system, brain, brainstem, cerebellam, corpus striatam and hypothalamus[13,14].

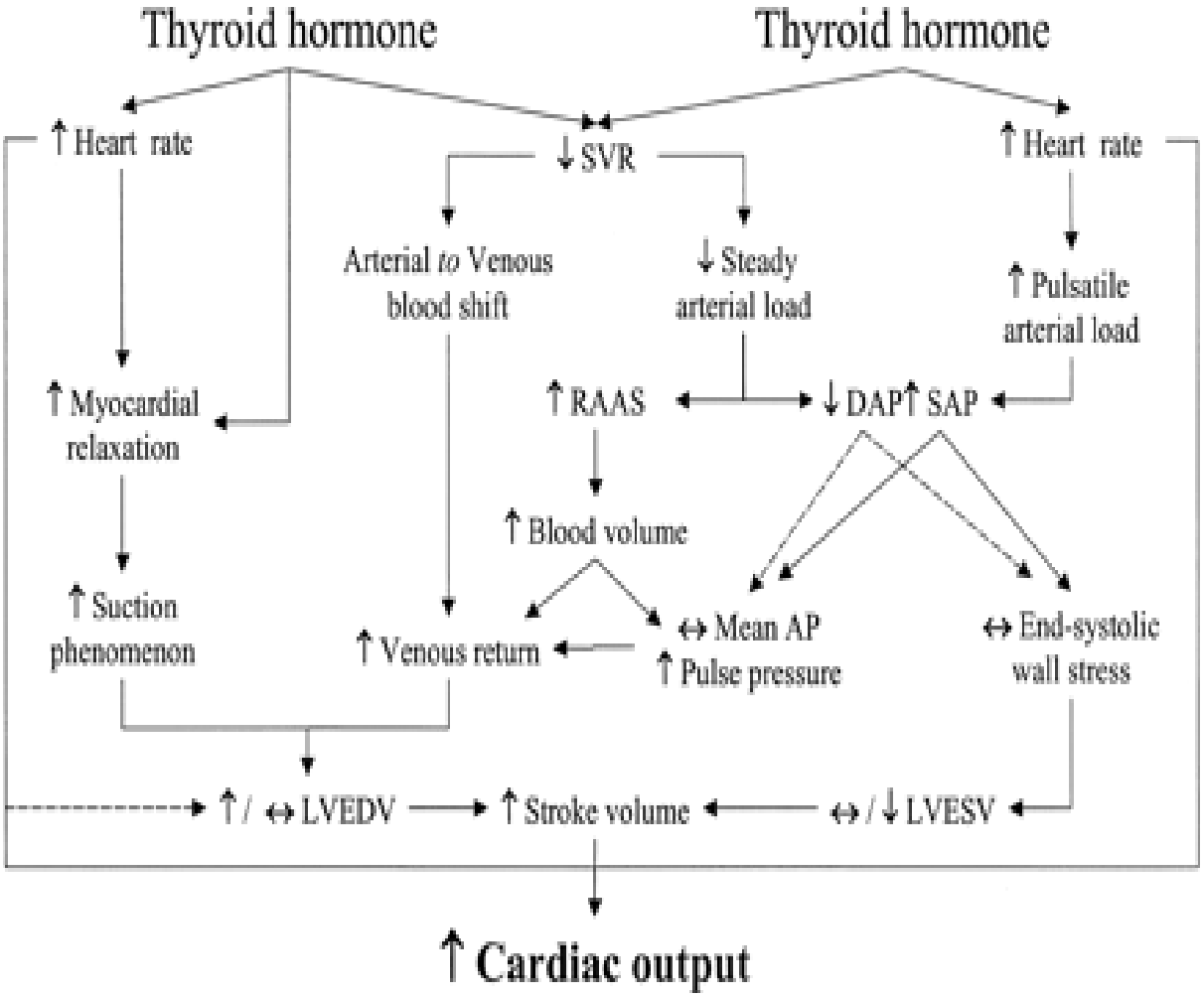
Types of Thyroid Hormone Receptors:

T3 receptors are alpha1, alpha2, beta1 and beta2. The Brain contains mostly T_3 receptor alpha, and the liver contains T_3 receptor beta; cardiac muscle contains both alpha and beta receptors[16]

Effects of Thyroid Hormone on the Cardiovascular System:

Increased action of T3,T4 to certain molecular pathways in the Cardio vascular system produces marked cardiovascular derangements. Hyperthyroidism causes a hyper dynamic cardiovascular state (i.e) increased cardiac output and reduce SVR causes increased, rapid heart rate and augmented LV systolic and diastolic function, and increased incidence of SVT like atrial fibrillation. Cardiovascular system responds to circulating T3, T4 levels causes permanent changes. Subclinical hyperthyroidism also causes sinus tachycardia, AF, augmented LV mass, diastolic dysfunction, exercise intolerance, and increased risk of cardiovascular mortality. Because all of these cardiovascular changes are reversed by appropriate early treatment is indicated to reduce cardiovascular mortality and morbidity [3]

Figure:2



In human at rest increased cardiac output due to this Pathophysiological mechanism of Thyroid hormones. (Dotted line represents inhibitory action).

SVR- Systemic vascular resistance
RAAS- renin-angiotensin-aldosterone system
DAP- Diastolic arterial pressure
SAP- Systolic arterial pressure
AP- arterial pressure
LVEDV- LV end-diastolic volume.
LVESV- LV end-systolic volume.

Cellular Effects of Thyroid Hormone on the Cardiovascular System:

Molecular and cellular mechanism of T3, T4 to the cardiovascular system is described. Figure1 described about T3,T4 may produce genomic , non- genomic effects on cardiac myocytes[17].

The genomic action of T3,T4 is initiated by the transcriptional activation or repression of specific target genes which encode structural and functional proteins[17]. This process begins with the entry of triiodothyronine (T3) into the cardiomyocyte. To date, there is no clear evidence of a biologically relevant conversion of thyroxine (T4) to T3 in cardiomyocytes[18.] In the cardiomyocyte, T3 enters the nucleus and interacts with specific transcriptional activators (NR alpha1) or repressors (NR alpha2). T3 receptor in combination with cofactors, forms the thyroid hormone-receptor complex to bind (NR alpha-1) or release (NR alpha-2) and specific sequences of DNA (thyroid-responsive elements) acting as cis or trans regulators modify the rate of transcription of specific target genes[19] .

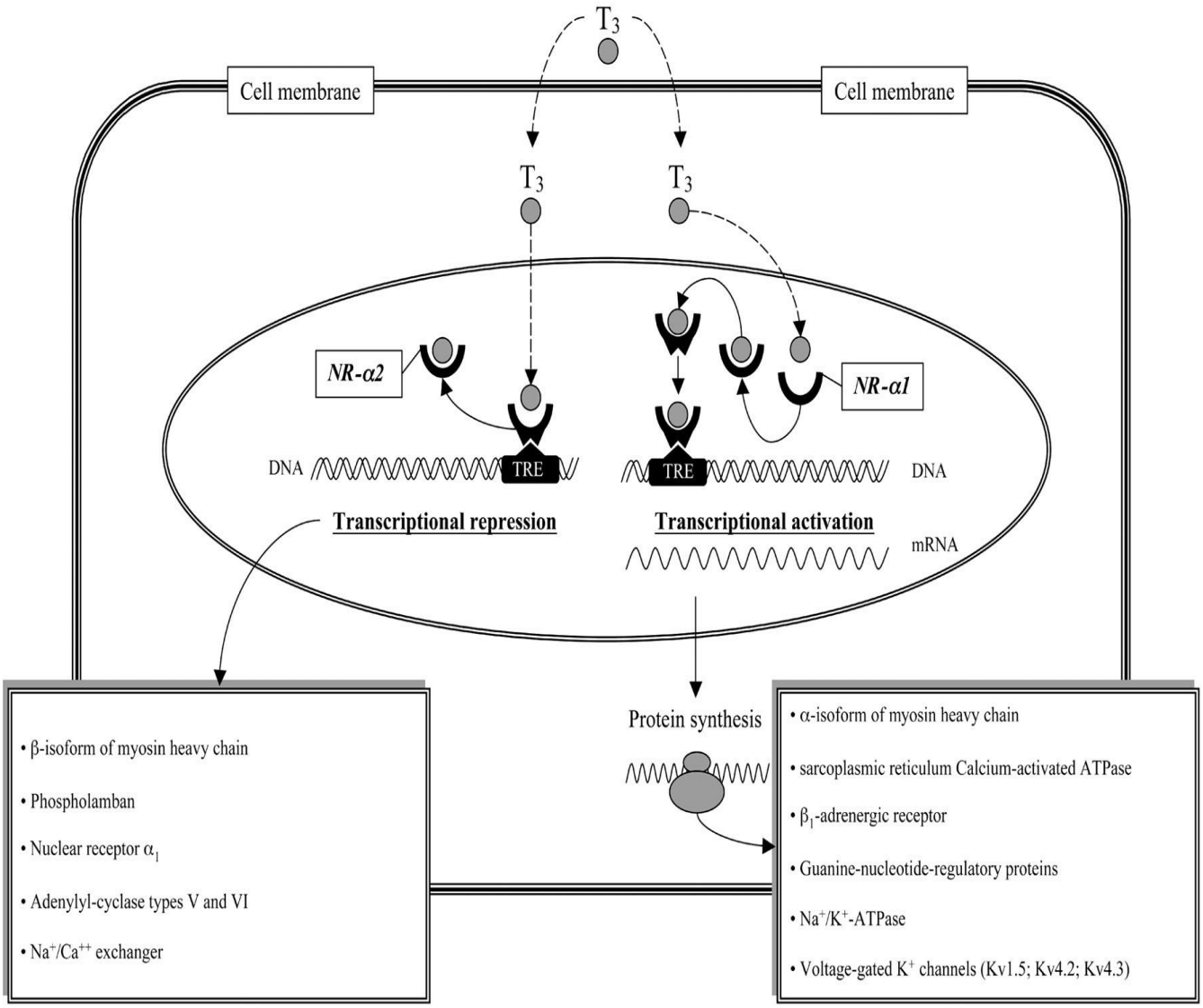


Figure 3.Genomic action of T3 on cardiomyocytes.

(NR- Nuclear receptor; TRE- Thyroid hormone responsive element.)

The other proteins are modulated at transcriptional levels like myosin heavy chains (MHC) and the sarcoplasmic reticulum protein called Calcium dependent Adenosine tri phosphatase and it's inhibitory cofactor named Phospholamban[17,20]. T3, T4 up regulates the alpha isoform of the MHC in cardiomyocytes and down regulates the beta isoform[21,22]. In humans, excess of beta isoform of MHC produces Cardio vascular effects by endothelium dependent and nondependent mechanisms[31] .

Physiological Effects of Thyroid Hormone on Cardiovascular System:

Thyroid hormone and heart rate :

Thyroid hormone causes increased heart rate, resting sinus tachycardia is commonly seen Cardiovascular system sign of human hyperthyroidism and thyrotoxicosis [32]. The increase in heart rate does not constant during First twenty four hours. Circadian rhythm variability is well maintained than normal cases [33] .Increased occurrence of AF has observed in cases with hyperthyroidism [34]. The increase in cardiac contraction, output and rate in hyperthyroidism cases is may be due to imbalanced sympathetic-parasympathetic activity due to an absolute sympathetic excessive drive[35]. Correlation between T3,T4 value and nocturnal sleeping heart rate in hyperthyroidism, thyrotoxicosis cases indicates that T3,T4 may be affect SA node firing [33,36,37].

Thyroid hormones effects on afterload of heart:

Ventricular afterload is reduced in hyperthyroidism patients. Thyroid hormone directly increase arterial smooth muscle relaxation causes to reduction in systemic vascular resistance will occur.

Hyperthyroidism:

Hyperthyroidism caused by Grave's disease, MNG and Toxic adenomas account for most of the cases of thyrotoxicosis.

Grave's Disease (GD):

Grave's disease accounts for 60-80% of thyrotoxicosis[1]. Grave's disease occurs in 2% of women population, but is 1/10 as frequent in men. It commonly occurs in the age group 20-50 years of aged populations[52].

The pathogenesis of grave's disease involves a combination of autoimmune and genetic causes. Comparatively smoking contributes small risk causes of GD and higher complication of ophthalmological problems may occur. There is a four-fold increase in incidence of grave's disease in post-partum state. Hyperthyroidism, thyrotoxicosis of GD is due to thyroid stimulating immunoglobulins. TPO (Thyroid peroxidase antibodies) may occur in 60-80% of cases. TPO most commonly associated with autoimmune disorder Hashimoto's thyroiditis than GD.

Multi nodular goiter (MNG):

Multi nodular goiter occurs (MNG) in up to 10% of adults. Multi nodular goiter is affected more in women, men's are less affected.

Pathogenesis involves a combination of environmental, autoimmune and genetic factors. Most nodules with in a Multi nodular goiter are polyclonal in origin, features suggesting a of hyperplastic response to locally produced cytokines and growth factors.

Toxic Adenoma:

An independently working single thyroid nodule described as ' Toxic adenoma". Most patients with toxic adenoma have acquired somatic, activating mutations in TSH-R. Thyrotoxicosis is usually mildly occur.

Clinical manifestations of hyperthyroidism:

The clinical presentation depends on the disease duration, severity, age and patients body reactivity to increase T3/T4 levels.

Table 1 shows : Common symptoms of hyperthyroidism:

Hyper activity,

Heat intolerance

Palpitations

Fatigue and weakness

Weight loss

Increased appetite

Polyuria

Oligomenorrhoea,

Goiter

Table 2 shows: Neurological manifestations of hyperthyroidism:

Tremor
Hyperreflexia
Muscle wasting, proximal myopathy
Periodic paralysis

GD that causes grave's ophthalmopathy. Ophthalmopathy occurs in 75% of cases of grave's disease within one year. The features includes lid retraction, periorbital edema, proptosis, chemosis, extra ocular muscle involvement, corneal involvement, optic nerve compression and visual loss.

Thyroid Skin lesion contribute in 6% of cases with GD and occurs with moderate to severe ophthalmopathy. It occurs commonly in anterolateral region of leg, so called Pretibial myxedema". Non-pitting type of edema.

Thyroid acropachy occur in less than one% of cases of grave's disease described as clubbing seen in fingers and toes and is strongly associated with dermatopathy. In patients with hyperthyroidism, skin is usually warm and moist. Palmar erythema, Pruritus, Plummer nail and onycholysis of nails may occur.

Gynaecomastia is rarely noted in men. Hypocalcaemia Osteopenia and fractures of long bones may be occur but rare.

Cardiac Symptoms:

Most of the patients have palpitations, have a rapid heart rate and the sensation of forceful cardiac contraction [42, ,43]. Rarely atrial rhythm disturbances may produce a sensation of an irregular heart rate or an increase heart rate or both events can occur. The sensation of exercising while at rest indicates the continuous high cardiac output state. Other common cardiac manifestations in hyperthyroidism and thyrotoxicosis are exercise intolerance and breathlessness on exertion.

In older patients mostly with initial features may be presented to tachycardia, probably due to paucity of adrenergic activity. With the onset of atrial fibrillation and extent of cardio vascular features may be exaggerated, proceeding to cardiac failure and edema.

Thyrotoxicosis cases may have chest discomfort similar to angina, probably caused by relative myocardial ischemia due to mismatch between increased oxygen demand and cardiac oxygen supply, coronary vasospasm[44]. The chest discomfort symptoms commonly disappear with treatment. In older

patient with, hyperthyroidism may mask the effect coronary artery heart disease.

Cardiac Signs:

Tachycardia is the commonest cardiac sign in hyperthyroidism. The mean blood pressure is may be normal. In older patients may have an increase Systolic blood pressure due to elastic components of arteries and a resulted elevated mean arterial pressure.

The carotid and peripheral arterial pulsations are may be hyper dynamics and brisk. There is a hyper dynamic precordial region with loud First heart sound, loud P2 and rarely Third heart sound and ejection click. Mid systolic murmur along the left sternal border usually heard due to increased flow. It is probably due to the rubbing together of normal pericardial and pleural surfaces by the hyper dynamic and circulatory heart. Auscultation over pulmonary areas shows pulmonary flow murmurs. Systolic murmurs of mitral and tricuspid regurgitation, secondary to papillary muscle dysfunction may occur. Patients with Grave's disease may have a higher incidence of mitral regurgitations and mitral valve prolapse as diagnosed by echocardiography[47]. This effects probably may be due to hemodynamic effects of hyperthyroidism rather than genetic factors.

Atrial Fibrillation:

In hyperthyroidism, thyrotoxicosis commonest ECG finding is Atrial fibrillation. This supra ventricular arrhythmia may occur of two–twenty percent hyperthyroidism cases. In hyperthyroidism constitute about five–fifteen percent newly identified cases of Atrial fibrillation. In Atrial flutter and other forms supraventricular tachyarrhythmias are very rare in hyperthyroidism and thyrotoxicosis. Occurrence of Ventricular fibrillation and ventricular premature contractions are also very rare in thyrotoxicosis.[40]

Electrocardiogram changes in Hyperthyroidism:

In hyperthyroidism cases electrocardiogram shows sinus tachycardia in most of the cases. Atrial fibrillation is noted in 12-18% of cases. Atrial fibrillation is seen more common in younger and elderly age patients. Sinus tachycardia is more in young individuals whereas atrial fibrillation is seen commonly in young and elderly. The electrocardiogram often shows widespread nonspecific ST-segment elevation and upward coving with terminal T wave inversion in about one third of cases. Intra atrial conduction abnormality may occur and prolongation PR interval occurs in 8-12% cases. Other rare findings may include shortening of QT interval, right bundle branch block, First, second or third degree heart block and paroxysmal supraventricular tachycardia [40, 41 , 61].

Chest X-ray in hyperthyroidism:

In patients with hyperthyroidism without cardiac disease X ray chest PA view is usually normal. In patients with cardiac manifestations may have Cardiomegaly. Prominent Pulmonary artery, aorta and left ventricle may be seen[76].

Echocardiographic abnormalities in hyperthyroidism:

Left ventricular contractility enhanced in patients with hyperthyroidism and thyrotoxicosis as compared with age related normal subjects. The augmented Cardiac output may be due to raised heart rate and stroke volume. As a result of Left ventricular ejection fraction, systolic function, increased in hyperthyroidism patients[62]. Cases of hyperthyroidism and thyrotoxicosis shows elevated LV systolic and diastolic contractile function. In hyperthyroidism cases Echocardiographic findings include cardiomegaly, diastolic dysfunction left ventricular hypertrophy, dilated cardiomyopathy, mitral regurgitation and mitral valve prolapse. Rarely systolic dysfunction is noted[64].

Management of Hyperthyroidism:

The hyperthyroidism, thyrotoxicosis is managed by anti- thyroid drugs or with radio iodine treatment (^{131}I) or by subtotal thyroidectomy. Anti- thyroid drugs are the predominant therapy in main modality of treatment is radio- active iodine is the first line treatment in South America. The differences reflecting the fact that no single approach is adequate and patients may require multiple level approach treatments to control hyperthyroidism and thyrotoxicosis.

Drugs usage to control hyperthyroidism:

Common drugs are Thionamides like Propylthiouracil, Carbimazole & Methimazole. All these drugs inhibit the function of thyro peroxidase enzyme, mechanism of action reducing oxidation & formation of iodide. Propylthiouracil inhibits deiodination of Thyroxine to Triiodothyronine.

The initial dose of carbimazole or methimazole is 10-20 mg every 8-12 hourly. Propylthiouracil is given at a dose of 100-200mg every 6-8 hourly. Lower doses of drugs suffice in areas of low iodine intake.

TFT, symptoms, signs are reexamined after 2-3 weeks to initiating treatment and drugs doses may be reduced according to the unbound Thyroxine (T4) levels. The usual maintenance doses of anti -thyroid drugs are 2.5 –10.0mg of carbimazole, methimazole and 50-100mg of propylthiouracil.

Maximum treatment control may be attained by two years. Patients with severe hyperthyroidism and large goiters are likely to relapse when treatment stops suddenly. Propranolol may be helpful in controlling sympathetic signs, importantly before anti thyroid medications to control symptoms and signs.

Radio iodine :

Radio iodine can be used for initial treatment or for relapses after anti thyroid drug treatment. There is a small risk of thyrotoxicosis crisis, can be prevented with prior treatment with anti -thyroid drugs. Antecedent treatment with anti -thyroid drugs should be considered for young and elderly patients and those with cardiac manifestations, to deplete thyroid hormone stores. Anti -thyroid drugs should be stopped minimum Three days prior to ensure optimum iodine uptake.^{131}I dosage ranges between185MBq and 555MBq.Hyperthyroidism can persist for 2-4 months post radio iodine therapy, for which beta blocker and anti- thyroid drugs like carbimazole or methimazole may be required. Persistent hyperthyroidism and thyrotoxicosis may be managed by 2nd cycle of radio iodine therapy after six months may be useful[56].

Subtotal thyroidectomy: is an alternate option for patients who relapse after anti -thyroid drugs. Some experts recommend surgery in the young particularly if the goiter is large and presence of pressure symptoms,

management of hyperthyroidism and supplementation of KI is required prior to surgery to reduce the vascularity and to avoid life threatening events like thyrotoxicosis crisis.

Ophthalmopathy usually requires no active treatment if it is mild. However, in severe cases may requires Inj. methyl prednisolone pulse or high dose oral glucocorticoids needed. Orbital decompression may be the treatment of choice in severe cases. Thyroid dermopathy may be managed with topical steroids therapy. Octreotide (somatostatin analogue) may be beneficial to the patients with opthalmopathy.

Management of toxic Multi nodular goiter is challenging one. Anti - thyroid drugs and beta-blockers normalize thyroid gland function. However they stimulate growth of goiter. Radio iodine is an option especially in the elderly usually more than 40 years of age. Surgery however is the definitive treatment for goiter as well as thyrotoxicosis. Radio iodine is the preferred treatment for toxic adenoma patients. Finally enucleation of adenoma or thyroid lobectomy indicated in refractory to medical management cases.

Management of thyrotoxic heart disease:

Heart rate reduction in patients of hyperthyroidism with or without cardiac disease is best controlled with beta-blockers. The goals of therapy are to slow down the heart rate, decrease symptoms and signs of cardiac decompensation and maintain blood pressure. Propanolol used cautiously in patients with cardiac decompensation state. They can be used synergistically with cardiac glycosides like tab. digoxin 0.25mg to reduce heart rate and is of benefit if cardiac failure is due to tachycardia[66].Iodine acts quicker than anti-thyroid drugs and hence may be used for rapid amelioration od hyperthyroidism state in patients with thyrotoxicosis cardiac disease[67] Patients with cardiac failure require digoxin and diuretics. When the situation beta-blockers are contraindicated, calcium channel blockers may be indicated for heart rate control. In hyperthyroidism cases have AF requirement of anticoagulant drugs may not be useful.

Hyperthyroid heart disease and response to treatment:

Treatment of hyperthyroidism control cardiac symptoms and signs in most of the cases. In hyperthyroidism aim of treatment is reversal of atrial fibrillation to NSR. With earlier appropriate treatment, thyrotoxicosis cardiomyopathy is totally reversible[72].finally with effective and intensive line

of treatment, cardiac symptoms, signs and functions revert to normal sinus rhythm in most of the cases.

MATERIALS AND METHODS:

Study population and design:

This is a descriptive, clinical and prospective study comprising of seventy cases of hyperthyroidism, thyrotoxicosis Patients attending medical OPD or admitted in medicine wards, Department of Internal Medicine, Thanjavur Medical College and Hospital . During the period from October 2011- November 2012.Informed consent obtained from all patients.

Inclusion Criteria:

Patients of newly diagnosed and untreated hyperthyroidism, thyrotoxicosis attending medical OPD or admitted in medicine wards, Department of Internal Medicine , Thanjavur Medical College and Hospital, Thanjavur. Hyperthyroidism was defined as

- Serum T3 level > 200 ng/dL
- Serum T4 level > 12 mcg/dL
- Serum TSH level < 0.3mU/mL
- (Measured by radio immuno assay method)

Exclusion Criteria:

Patients already diagnosed cases of Hyperthyroidism on regular treatment. Unwilling for informed consent and patients who were participate in this descriptive and prospective study and follow up after six months period of treatment.

Method:

Patients attending medical OPD or admitted in medicine wards with clinical features of hyperthyroidism symptoms and signs are examined clinically and diagnosed by the following biochemical methods and Imaging investigations.

Complete blood picture/Peripheral smear study.

Urine routine

RBS

RFT

Sr. Electrolytes

TFT

LFT

Lipid profile analysis

Sr. Calcium

Sr. Phosphorus

X-ray chest PA view

ECG

Echocardiogram

FNAC Thyroid gland

USG Neck

The patients were regularly followed up after 6 months of initial evaluation and patients were re-evaluated with clinical examination, thyroid function test, Chest X-ray, ECG and Echocardiogram.

To appreciate and elicit the association and comparison between different parameters Pearson's Chi-Square" test formula was used .For all statistical purposes a two tailed probability of P value <0.05 was considered to be significant.

OBSERVATIONS AND RESULTS:

Demographic Profile:

Age of Presentation:

The mean age of presentation was 42.08 years. The youngest patient was 18 years and the eldest was 72years. 63% of patients were between 30and49years of age. 25% of patients were above 50 years of age. Whereas 12% of patients less than 30 year of age.

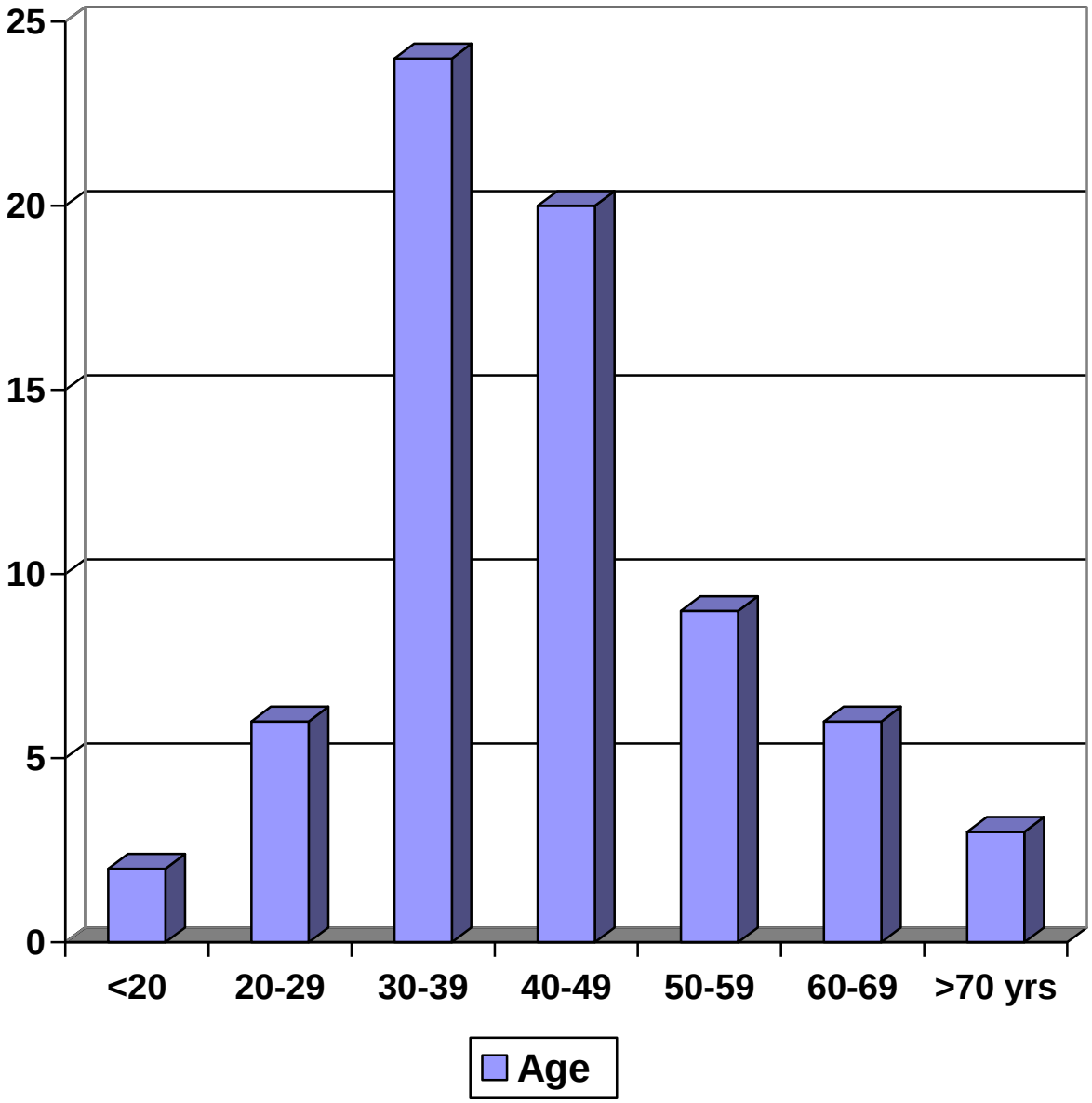


Figure4: Age distribution of 70 cases of hyperthyroidism.

Table3 shows : Age distribution and etiology of hyperthyroidism:

Age group (years)	Grave's (n=42)	MNG (n=25)	Solitary nodule (n=03)
>70 years	1	2	0
60-69years	3	3	0
50-59years	6	3	0
40-49years	14	6	0
30-39years	12	10	2
20-29years	4	1	1
<20years	2	0	0

All patients less than 40 years had Grave's disease. All patients with age more than 70 years had Grave's and multi nodular goiter .60% cases of Grave's disease and 36% cases of MNG in the age group between 30 and 49 years. All patients with solitary nodule were between 20 and 39 years of age.

Sex Distribution:

Of the Seventy cases, 85.71% (60/70) were females and 14.29% (10/70) were males. The male: female ratio was 1:6.

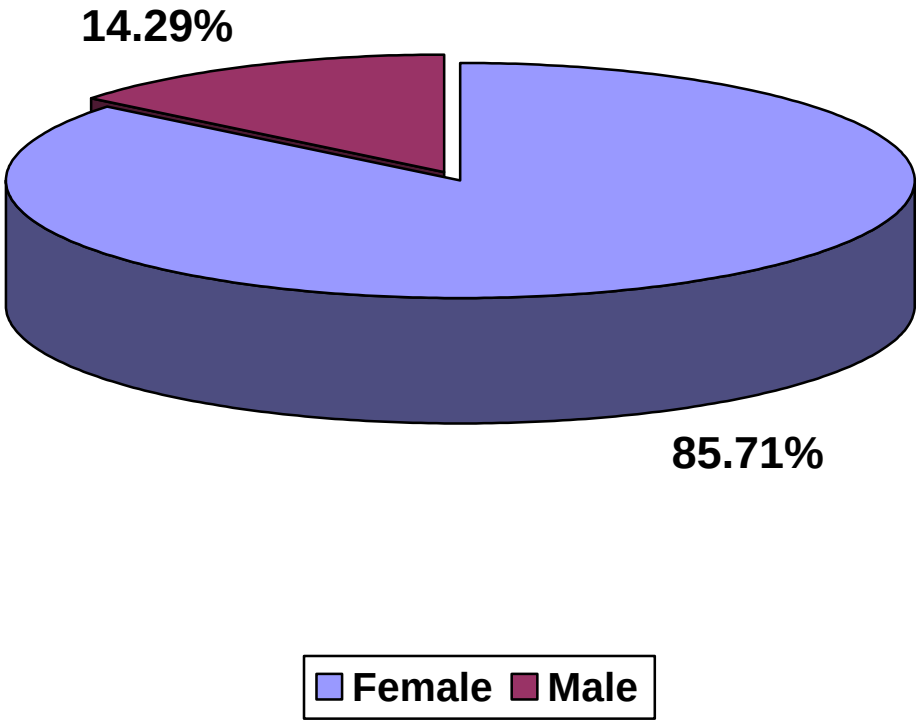


Figure 5: Sex distribution of 70 cases of hyperthyroidism.

Table 4 shows: Sex distribution and etiology of hyperthyroidism:

Etiology	Female	Male
Grave's	38	4
MNG	20	5
Solitary nodule	2	1

90.47 % of cases of Grave's disease and 80% of patients of Multi nodular Goiter patients were females.

Duration of Symptoms:

Table 5 shows: Duration of symptoms:

Duration	No of Patients	Percentage
<1 year	46	66%
1-2 years	12	17%
> 2 years	12	17%

Majority of the patients were had clinical symptoms and signs of less than one year duration of the illness.

Non-cardiac symptoms:

Heat intolerance and Fatigue were the commonest presenting symptoms of the patients. Patients have less symptoms of tremors only 11% of our study.

Table 6 shows: Non cardiac symptoms in hyperthyroidism:

Symptom	No of Patients	Percentage
Heat intolerance	48	69%
Fatigue	46	66%
Weight loss	35	50%
Increased appetite	20	29%
Diarrhea	12	17%
Oligomenorrhea	10	14%
Tremor	8	11%

Cardiac Symptoms:

The commonest cardiac symptom was Palpitations, being present in 55 cases.79% of patients had cardiac symptoms at the time of admission. All patients with edema of ten cases, 14% of patients associated with palpitations.

Table 7 shows: Cardiac Symptoms in hyperthyroidism

Cardiac symptoms	No of Patients	Percentage
Palpitations	55	79%
Edema	10	14%
No cardiac symptoms	14	20%

Physical Signs shows:

Tachycardia was present in 80% cases (56/70). The mean heart rate was 105.86. Twelve patients (17%) had atrial fibrillation. Out of these 12 cases, Eleven patients had controlled ventricular rate. Thirty four patients (48%) had hypertension. 42%patients had systolic hypertension were less than 60 years old. The mean pulse pressure was 58mmof hg. Wide pulse pressure of more than 60 mmHg was present in 36 %cases (25/70) cases.

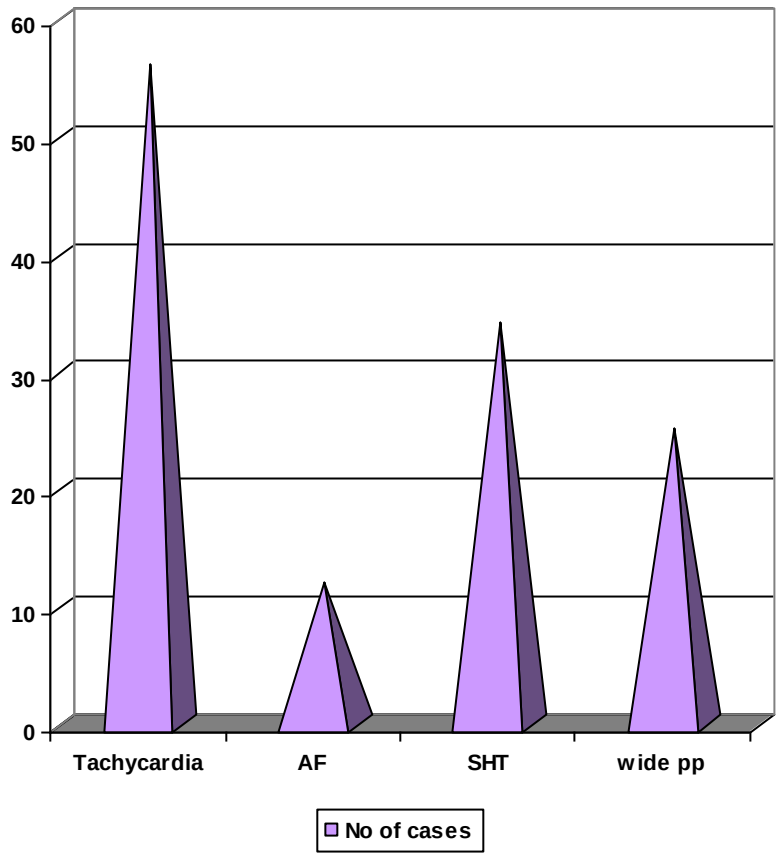


Figure 6: Heart rate and Blood pressure in hyperthyroidism.

Cardiovascular Signs shows:

In this study 54/70 of patients had cardiac signs (77.14%). Loud first heart sound (S1) was the commonest cardiac sign observed. 14.2% of patients had cardiac failure.

Table 8 shows: Cardiac signs in hyperthyroidism:

Sign	No of Patients	Percentage
Loud S1	20	29%
Ejection systolic murmur (pulmonary area)	12	17%
Cardiac Failure	10	14.2%
Pansytolic murmur (mitral)	8	11%
Early diastolic murmur (aortic area)	4	6%

Neurological signs shows:

Neurological signs were observed in 51% cases (36/70). Tremor was the commonest neurological sign followed by hyperreflexia. One Patient had proximal myopathy and periodic paralysis.

Table 9 shows: Neurological Signs in hyperthyroidism:

Neurological abnormality	No of Patients	Percentage
Tremor	36	51%
Hyperreflexia	16	23%
Proximal myopathy	1	1.42%
Periodic paralysis	1	1.42%

50% of the patients had thyroid ophthalmopathy (32/70). Eight patients (16%) had dermatopathy.

Biochemical Profile shows:

The mean T3 shows 402.46 nanogram /deciliter (normal range 60-200 nanogram /dl), T4 shows 23 microgram/dl (normal range 4.5-12.0 microgram/dl) and TSH shows 0.036mU/ml (normal range 0.3-5.03mU/ml). Sixteen patients had (22%) elevated transaminases and Ten patients had dyslipidemia (14%).

Table 10 shows: T3 levels in hyperthyroidism:

T3 level (ng/dl)	No of patients	Percentage
< 200	2	3%
200-399	40	57%
400-599	20	29%
600-799	7	10%
>800	1	1%

57% of patient had T3 levels between 200 and 399 ng/dl.

Table 11 shows.T4 levels in hyperthyroidism:

T4 level (mcg/dl)	No of patients	Percentage
12-17	30	43%
18-23	30	43%
24-30	10	14%

Table 12 shows. TSH levels in hyperthyroidism:

TSH level (mU/ml)	No of patients	Percentage
<0.009	25	36%
0.01-0.009	35	50%
>0.1	10	14%

Etiological Profile shows:

Grave's disease accounted for 60% cases (42/70), Multi nodular goiter-36% cases (25/70). Three cases of solitary nodule were observed 4% in this study.

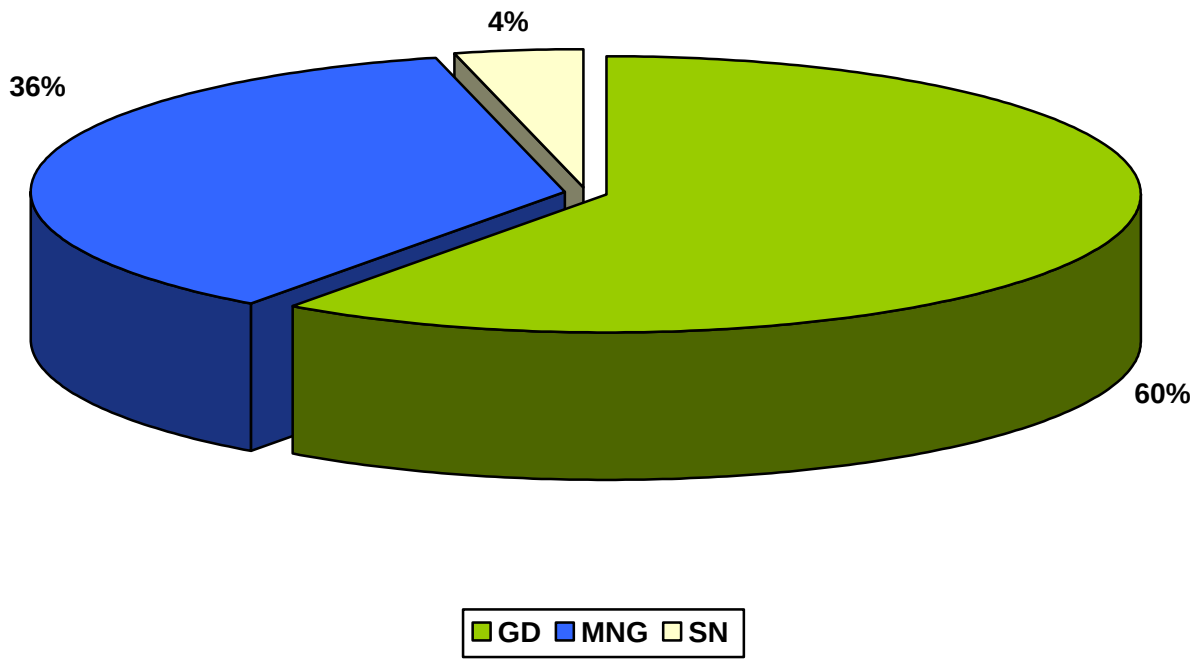


Figure 7: Etiological profile of hyperthyroidism.

Electrocardiogram (ECG) shows:

ECG abnormal findings were observed in 80% cases (56/70). The commonest findings observed in ECG was Sinus tachycardia 56 cases (80%). Twelve of patients had Atrial fibrillation was observed in 17% cases.

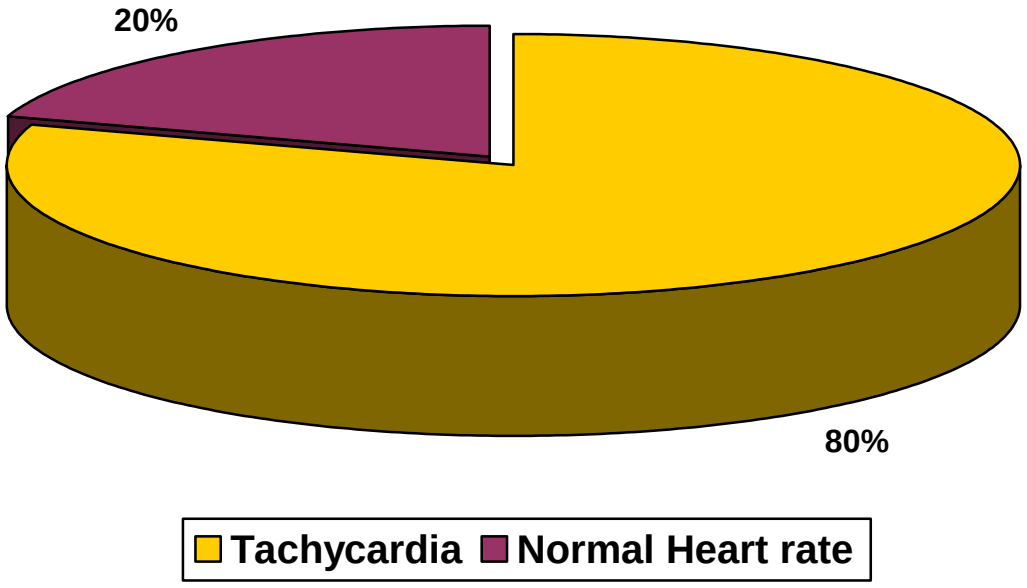


Figure 8: Heart rate.

Table 13 shows: ECG abnormalities in hyperthyroidism shows:

ECG abnormality	No of Patients	Percentage
Sinus tachycardia	56	80%
Atrial fibrillation	12	17%
Left ventricular hypertrophy	9	13%

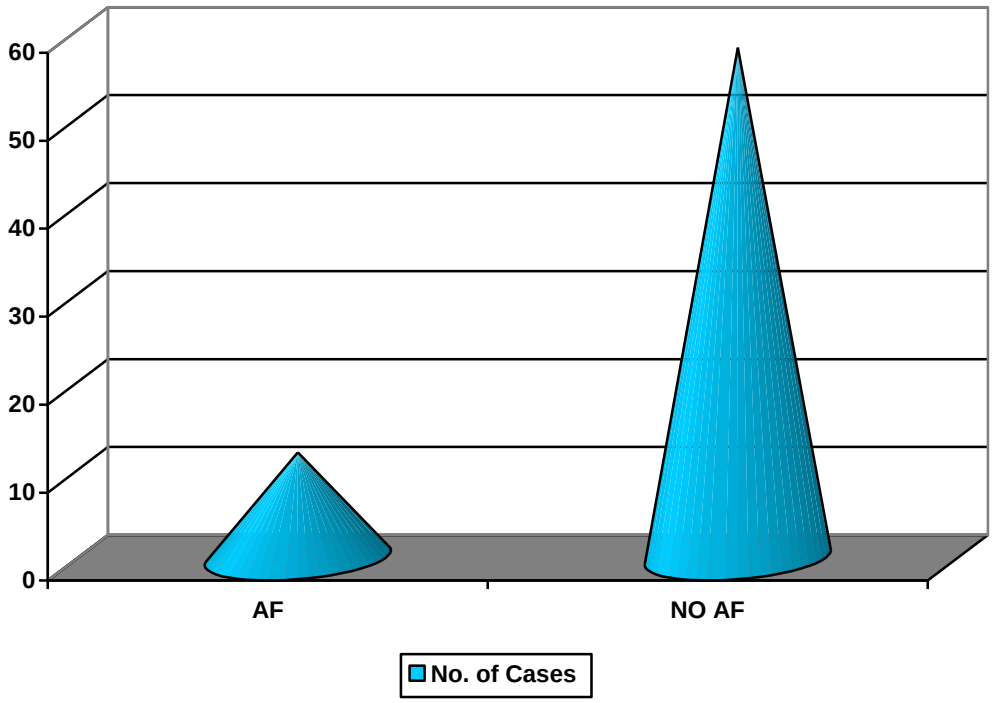


Figure 9: Atrial fibrillation in hyperthyroidism.

Chest X-ray:

Chest X-ray was normal in 56 patients. Fourteen patients (20%) had cardiomegaly and four patients had pulmonary hypertension.

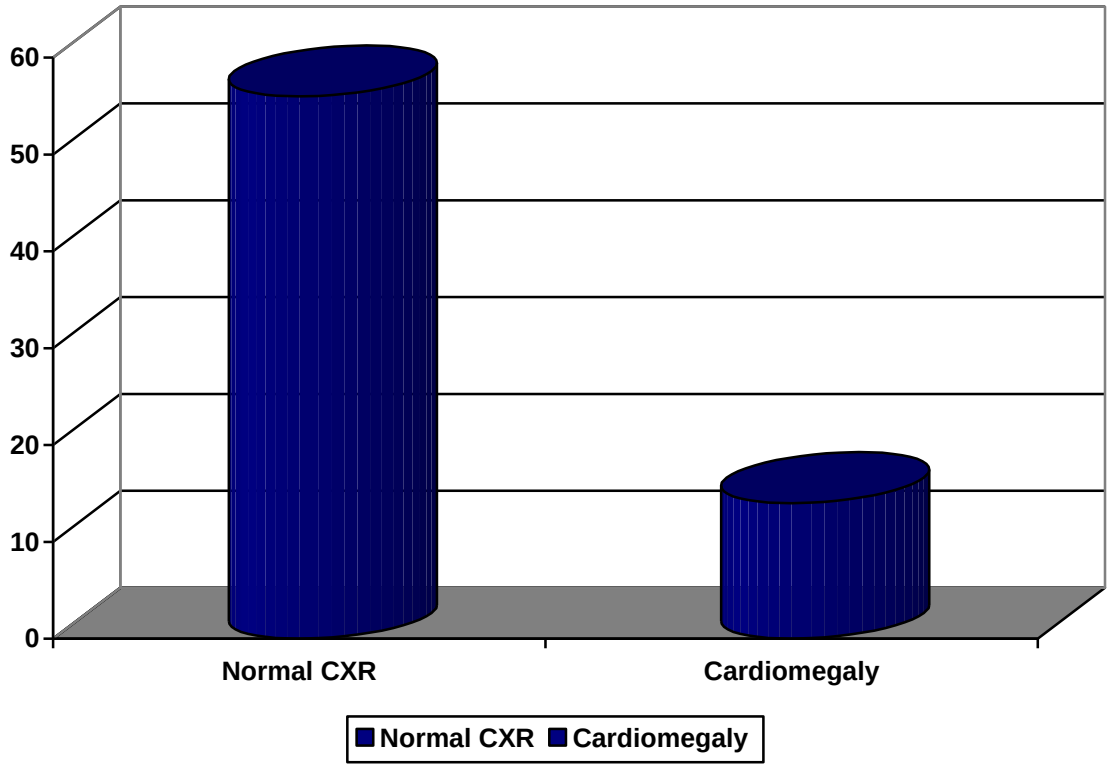


Figure 10: Chest X-ray abnormalities in hyperthyroidism.

Echocardiography:

Echocardiographic abnormalities were noted in 56% cases (39/70). 29% (20/70) of patients had Diastolic dysfunction was the commonest echocardiographic finding observed. Ten patients had Mitral regurgitation (14%). Nine patients had Left ventricular hypertrophy (13%). Four patients had Pulmonary hypertension (6%). Three patients had Aortic and Tricuspid regurgitations (4%). Two patients had Mitral valve prolapse (3%).

Table 14 shows. Echocardiographic abnormalities in hyperthyroidism :

Abnormality	No of Patients	Percentage
Diastolic dysfunction	20	29%
Mitral regurgitation	10	14%
Left ventricular hypertrophy	9	13%
Pulmonary hypertension	4	6%
Aortic regurgitation	3	4%
Tricuspid regurgitation	3	4%
Mitral valve prolapse	2	3%

The mean ejection fraction was 63.26 %. Out of the 20 patients with diastolic dysfunction, 29% (20/70) were above 40 years of age. 38.4 % patients (20/70) with diastolic dysfunction had associated hypertension. However none of the patients less than 40 years with diastolic dysfunction (6/13) had hypertension. Left atrial enlargement was seen in 33.33% (4/12) of cases with atrial fibrillation. Patients with left atrial enlargement were observed more than 50 years of age. ECG and ECHO showed left ventricular hypertrophy in observed for Nine cases.

Fine Needle Aspiration Cytology shows;

FNAC was done in seventy cases.

Table 15 shows: FNAC findings shows:

FNAC finding	No of Patients	Percentage
Lymphocytic infiltrates	31	44.2%
Colloid nodule	29	41.4%
Follicular cells	4	6%
Follicular adenoma	4	6%
Benign nodular goiter	2	3%

Ultrasonography of thyroid shows:

Ultrasonogram of Thyroid was done in Seventy patients in this study observations shows:42% cases of Grave's disease, 25% cases of Multi nodular goiter, only 3% cases of Solitary nodules of Thyroid gland.

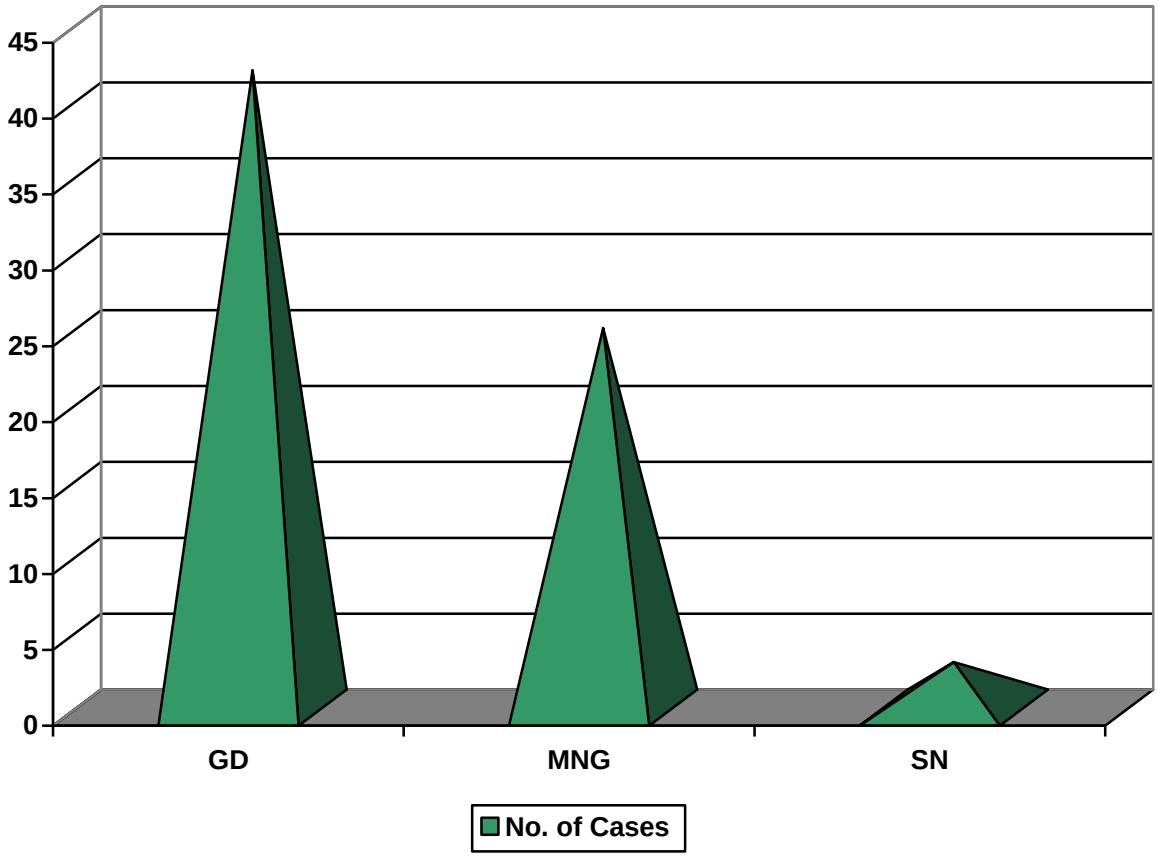


Figure 11: Ultrasonogram findings.

Correlation of Cardiac findings with Etiology shows:

Cardiac Symptoms and etiology shows:

Table 16 shows: Cardiac symptoms and etiology shows:

Etiology	No of patients with cardiac symptoms	Percentage
Grave's disease (n=42)	35/42	83%
MNG (n=25)	16/25	64%
Solitary Nodule (n=3)	1/3	34%

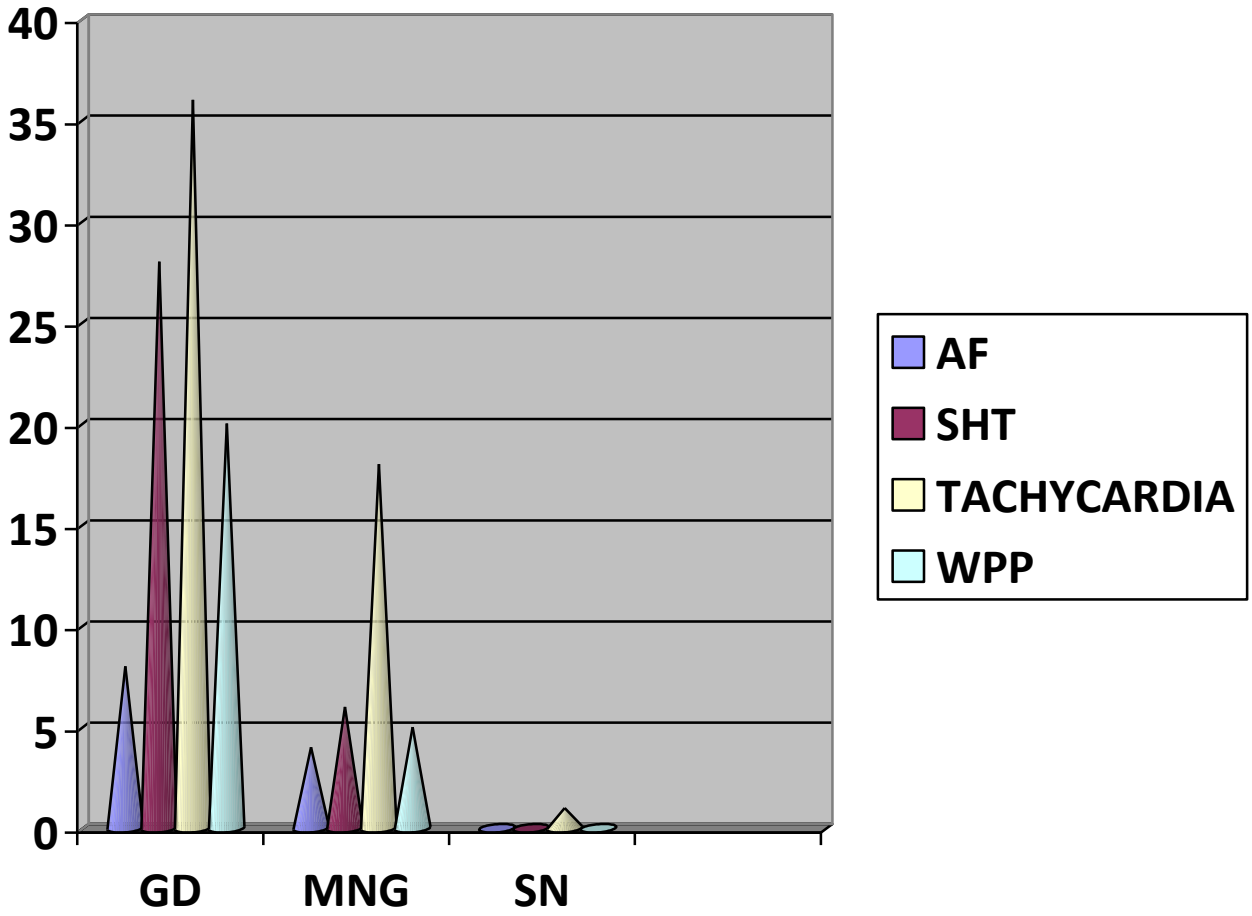


Figure 12: Physical signs and etiology.

Table 17 shows: Physical signs and etiology of this study shows:

Etiology	**Tachycardia**	**Atrial fibrillation**	**Systolic hypertension**	**Wide pulse pressure (>60)**
Grave's disease	80%	30%	58%	46%
MNG	60%	10%	26%	22%
Solitary nodule	20%	0%	0%	0%

Cardiovascular abnormalities and etiology of this study shows:

Table 18 shows: Cardiovascular findings and etiology:

Cardiac signs	Grave's (n=42)	MNG (n=25)	Solitary nodule (n=3)
Loud S1	14(34%	6(24%)	-
Ejection systolic murmur (pulmonary)	9(21.4%	2(8%)	1(8%)
Cardiac Failure	8(60%)	2(40%)	-
Pansytolic murmur (mitral)	6(14.2%)	2(8%)	-
Early diastolic murmur (aortic)	3(7.14%)	1(4%)	-

Table 19 shows: ECG findings and etiology:

ECG finding	Grave's (n=42)	MNG (n=25)	Solitary nodule (n=3)
Tachycardia	36(85.7%)	19(76%)	1(33.3%)
Atrial fibrillation	8(19%)	4(8%)	-
LVH	7(17%)	2(8%)	-

Chest X-ray PA view showed cardiomegaly in17% cases of grave's disease (7/42) and 8% case of Multi nodular goiter (2/25).

Echocardiographic abnormalities and etiology shows:

Echocardiographic findings were observed in 66.6% (28/42) patients of grave's disease, 40% (10/25) cases of Multi nodular goiter, 33.3% (1/4) patients of solitary nodule.

Table 20 shows: Echo findings and etiology:

Echo findings	Grave's disease (n=42)	MNG (n=25)	Solitary nodule (n=3)
Diastolic dysfunction	16(38%)	3(12%)	1(33.3%)
Mitral regurgitation	9(21.4%)	1(4%)	-
Pulmonary hypertension	3(4.76%)	1(4%)	-
Aortic regurgitation	3(7.14%)	-	-
Tricuspid regurgitation	3(7.14%)	-	-
Mitral valve prolapse	2(4.76%)	-	-
Left ventricular hypertrophy	7(17%)	2(8%)	-

Correlating the etiology and clinical symptoms and signs and investigations, it was observed that atrial fibrillation was significantly associated with Grave's disease (p value<0.05). However if p value more than 0.05 statistically it is not significant. In Grave's disease patients had more systolic hypertension and wide pulse pressure of more than 60 mmHg was seen in 47.6% patients with Grave's compared to 20% of patients with Multi nodular goiter. Hence patients with Grave's disease had severe disease than other causes of hyperthyroidism and Thyrotoxicosis.

Correlation of cardiac abnormalities with thyroid function tests and severity of hyperthyroidism of this study shows:

The observations were statistically analyzed using ' Pearson Chi-square" test to find out the correlation between cardiac abnormal symptoms and signs and thyroid hormone levels. For convenience, T3, T4 and TSH levels were further subdivided in to arbitrarily.

T3 <200 (ng/dl)	T4 12-17 (mcg/dl)	TSH <0.009 (mU/ml)
200-399	18-23	0.01-0.09
400-599	24-30	>0.1
600-799	>30	
>800		

T3, T4 and TSH levels were compared with cardiac symptoms Palpitations, Tachycardia, Atrial fibrillation, Hypertension, Wide pulse pressure, Cardiac signs, , Chest X-ray PA view, ECG and Echocardiographic findings.

Statistically accurate correlation observed between thyroid hormone levels (severity of hyperthyroidism) and cardiac symptoms and signs, heart rate, pulse pressure, , chest X-ray PA view, ECG and Echocardiographic findings (Pvalue less than 0.05).

Hence, the severity hyperthyroidism disease correlated with atrial fibrillation in this study. High T3 with low TSH levels correlated with the presence of atrial fibrillation (p values 0.028 and 0.0669respectively). T4 levels were correlated significantly with atrial fibrillation (p value 0.062). High T4 levels and low TSH levels were significantly correlated with the presence of systolic hypertension (p values 0.06 and 0.08 respectively) in this study. T3 levels correlate with presence of systolic hypertension (p value 0.060).

Grave's disease was found to have severe disease associated with high (T3, T4 levels and low TSH levels) as compared to Multi nodular goiter and solitary nodule. The p values correlating T3, T4 and TSH with Grave's disease were 0.06,0.07 and 0.042 respectively observed in this study.

Correlation of cardiac abnormalities with age of this study shows:

Table 21 shows: Cardiac symptoms & signs and age shows:

Age (Years)	Cardiac Symptoms	Tachycardia	Atrial Fibrillation	Systolic hypertension	Wide Pulse pressure
<20years(noof cases-2)	1	0	0	0	0
20-29 years(no of cases-6)	2	2	1	3	2
30-39years (no of cases-24)	22	23	5	10	10
40-49 years (no of cases-20)	18	19	4	8	8
50-59years (no of cases-9)	6	5	1	7	2
60-69years (no of cases-6)	4	5	1	6	2
>70years(noof cases-3)	2	2	0	0	1

Table 22 shows: Cardiac abnormalities and age shows:

Age (Years)	ECG abnormalities	CXR abnormalities	Echo abnormalities
<20 years (no of cases-2)	1	0	0
20-29years (no of cases-6)	2	1	2
30 -39 years (no of cases - 24)	22	7	15
40-49years (noof cases-20)	19	4	10
50-59years (no of cases-9)	7	1	6
60-69years (no of cases-6)	3	1	5
>70 years (no of cases-3)	2	0	1

A correlation was noted between atrial fibrillation and age between 30 to 49 years ($p<0.05$). Other cardiac abnormalities also associated with significant association with age.

Treatment:

All patients were treated with antithyroid drugs. Carbimazole was given for 46 patients. Eight patients received propylthiouracil. Two patients received both carbimazole and propylthiouracil in view of severe disease. All patients except two patients with bronchial asthma received propranolol. That patient was given verapamil. Carbimazole with Digoxin given for five cases. Carbimazole with Lasix given for seven cases. Seventy patients were initially treated with drugs alone. Patients whom refractory to medical treatment underwent surgical treatment. Out of these Seventy cases, (20/70) Twenty patients underwent surgery. Twelve cases of GD underwent Total thyroidectomy. Seven patients of MNG underwent subtotal thyroidectomy and One patients of solitary nodule underwent hemi thyroidectomy.

Table 23 shows: Treatment Profile to Control cardiac signs and symptoms:

Treatment	No of patients	Percentage
Drugs alone	50	71.42%
Surgery	20	28.57%

Table 24 shows: Drug Profile of this study shows:

Drugs	No of patients
Carbimazole, propranolol	46
Carbimazole, propranolol, lasix	7
Propylthiouracil, propranolol	4
Propylthiouracil, propranolol, lasix	4
Carbimazole, propranolol, digoxin	5
Carbimazole,propranolol, propylthiouracil	2
Carbimazole, verapamil, propylthiouracil	2

Follow up:

The patients were followed up and re-evaluated after 6 months. Two patients was expired of cardiac failure during the follow up period and Sixty eight patients were reevaluated after six months.

Follow up cardiac symptoms after six months:

On follow up, out of the Sixty eight patients only six patients (9%) had persisting cardiac symptoms, in the form of palpitations. Edema presented in Two patients.

Follow up cardiac signs after six months shows:

Table 25 shows: Follow up Cardiac signs after six months shows:

Physical sign	No of patients	Percentage
Tachycardia	4	6%
Systolic hypertension	1	1.47%
Atrial fibrillation	1	1.47%

The mean heart rate on follow up was 86/min. Tachycardia was present in 6% of cases. 1.47% patients had hypertension and1.47% patients had atrial fibrillation.

On follow up, one patient (1.47%) had loud S1, one patient (1.47%) had ejection systolic murmur, two patients (2.94%) had pansystolic murmur and two

patients (2.94%) had early diastolic murmur. One of the patients had cardiac failure on follow up.

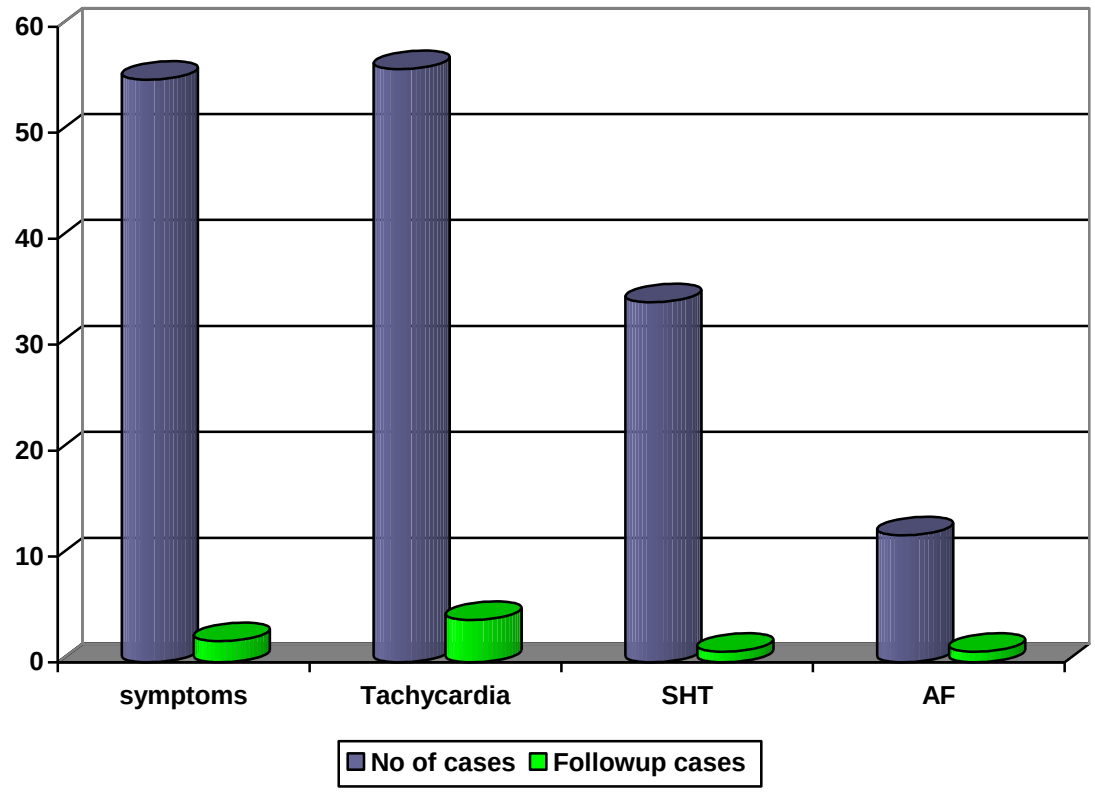


Figure 13: Comparison between baseline and follow up cases of cardiac symptoms and signs.

Follow up thyroid profile after six months shows:

Eight patients (12%) had mild hyperthyroidism on follow up. On follow up mean T3 was 172.8ng/dl, mean T4 was 09.26mcg/dl and mean TSH was 0.928 micro unit /ml.

Follow up ECG after six months of this study shows:

Ten percent patients had ECG abnormalities on follow up. LVH persisted in eight follow up patients .Out of these twelve patients with atrial fibrillation, in Eleven patients sinus rhythm was achieved. One patient had persistent atrial fibrillation.

Follow up Chest X-ray after six months shows:

6% percent (4/68) patients had cardiomegaly on follow up

Follow up Echocardiography after six months shows:

With regular treatment, on follow up there was reduction in the echocardiographic abnormalities. The mean ejection fraction on follow up was 64.04%.

Table 26 shows: Follow up Echocardiography after six months shows:

Abnormality	**No of Patients**	**Percentage**
Diastolic dysfunction	4	6%
Mitral regurgitation	2	3%
Left ventricular hypertrophy	8	12%
Pulmonary hypertension	1	3%
Aortic regurgitation	1	3%
Tricuspid regurgitation	0	-
Mitral valve prolapsed	1	3%

Treatment modality and response to treatment shows:

The response to treatment as assessed by resolution of symptoms and signs, improvement in thyroid profile and improvement or resolution of ECG, Chest X-ray and echocardiographic abnormalities-in the treatment groups were statistically analyzed and compared using Chi-square test. Statistically correlation observed the treatment cases ($p<0.05$). To conclude, no treatment modality was superior over the other and response to treatment is not dependent on the treatment modality adopted.

Data was obtained and analyzed to find whether, response to treatment and treatment outcomes have any correlation with etiology of hyperthyroidism. Statistically significant correlation was noted between etiology of hyperthyroidism and treatment outcome ($p<0.05$).

DISCUSSION:

A descriptive, prospective study about cardiac manifestations of hyperthyroidism was conducted among 70 consecutive patients of hyperthyroidism, thyrotoxicosis attending medical OPD or admitted in medicine wards, Department of Internal Medicine, Thanjavur Medical College and Hospital, Thanjavur during the period from October 2011- November 2012.The data was obtained and analyzed statistical correlation using Pearson's Chi-square test".

Age Distribution:

The mean age of presentation was 42.08years. 63% of patients were between 30 and 49 years. 60% of cases with GD and 36% of cases with MNG the age between 30 and49 years. This is comparable with the existing literature showing common occurrence of Grave's disease in the 20-50 age group[1] .All patients with solitary nodule were between 30 and 49years.age <20 years age patient had Grave's disease. Patients were age more than 70 years had Multi nodular goiter.

Sex Distribution:

Females were more affected than males in the current study. This is consistent with available literature[1,77.] The male: female ratio in this study was 1:6. The male: female ratio was 1:9.5, 1:4 and 1:2 in patients with Grave's disease, Multi nodular goiter and toxic adenoma respectively. A higher proportion of males were noted in this study. Literature shows a male: female ratio of 1:10 in patients with Grave's disease[1].

Modes of Presentation:

Heat intolerance, fatigue, Diarrhea and weight loss were the other commonest presenting symptoms noted in this study.

Table27shows: Comparison of presenting symptoms in hyperthyroidism:

Symptom	**Present study (%)**	**Bhadada S et al [78](%)**
Weight loss	50%	82.1
Heat intolerance	69%	76.8
Increased appetite	29%	73.2
Diarrhea	17%	48.2

Neurological abnormalities were seen in 65% cases. Tremor was the commonest neurological sign (51%), followed by hyperreflexia (23%). However, only 11% patients observed tremor as a presenting symptom in our study.

Thyroid ophthalmopathy was observed in 50% cases in our study. Among Grave's disease patients, 80% had ophthalmopathy, comparable to the existing literature showing ophthalmopathy in 75% cases [1].We noticed a slightly higher incidence of dermopathy (12%) as compared to the reported 5%[1] .

Cardiac symptoms, signs and abnormalities:

Palpitation was observed as a commonest cardiac symptom in our study, which was well correlate with the available literature [41,42,43] . In our study, 79% patients had cardiac symptoms on presentation.

80% of our cases had tachycardia, 17% had atrial fibrillation and 49% had systolic hypertension. A wide pulse pressure was noted in 36% cases. As per the literature, In hyperthyroidism tachycardia is the commonest cardiac sign. In this study shows 17% of cases had AF, which was comparable with the reported prevalence of 2-20% [41,49,50.]

Cardiovascular system examination showed abnormalities in 67% cases, the commonest being a loud S1.Among the murmurs presentation Pulmonary ejection systolic murmur due to hyper dynamic circulation was the commonest one, seen in 17% of patients.14.2 % of patients had cardiac failure.

Table 28 shows: Comparison of cardiac symptoms and signs shows:

Cardiac abnormal features	**In our study (%)**	**Klein et al[43] (%)**
Palpitations	79%	85%
Tachycardia	80%	95%
Atrial fibrillation	17%	15%
Wide pulse pressure	36%	75%
Cardiac murmurs	34%	50%
Edema	14%	05%

Electrocardiogram abnormalities were seen in 80% cases, tachycardia being the commonest abnormality observed in our study. AF was observed in 17% of cases. Cardiomegaly was observed in chest X-ray PA view 14% of patients. Echocardiographic abnormalities were noted in 56% of patients. Diastolic dysfunction was noted in 29% of patients. Valvular involvement were noted in our study. Among the observations of the valvular abnormalities, mitral regurgitation was the commonest one. Diastolic dysfunction was common in patients above 40 years and 42.4% of patients with diastolic dysfunction had associated hypertension. Advanced age of the patient and hypertension are risk

factors for diastolic dysfunction. However none of the patients less than 40 years of age with diastolic dysfunction (8/20) had hypertension. Also 30% of our subjects of less than 40 years had diastolic dysfunction compared to the normal prevalence of 2-4% in the age group of 25-35 years. Hence the younger age groups of hyperthyroidism, thyrotoxicosis patients is an independent risk factor for diastolic dysfunction observed in our study. LAE was noted in 46% (5/12) cases have Atrial fibrillation. All patients with left atrial enlargement the age group between 30- 60 years of age. In a previous study analyzing the relationship between LAE with Atrial fibrillation in hyperthyroidism, left atrial enlargement existed in 9% of patients younger than 40 years of age.

Table 29 shows: Comparison of cardiac abnormalities:

Cardiac abnormalities	**Present Study**	**De Carvalho filho et al[75]**
Symptoms	80%	70.9%
ECG abnormalities	80%	83.3%
Tachycardia	66.6%	62.5%
Atrial fibrillation	17%	33.3%
Cardiomegaly	22.2%	64.7%

Electrocardiogram abnormalities observed in our study was comparable with the available literature [40,41,61]. We observed less cardiomegaly and atrial fibrillation. This may be due to the fact that we had less number of elderly patients in this study.[49,50] Embolic episodes were noted in one of our patients.

Etiological Profile:

Grave's disease was the commonest cause of hyperthyroidism in our study. 60% of our cases of hyperthyroidism were due to Grave's disease. This is slightly less compared to the reported incidence of 60-80%[1].We had only very few cases of toxic adenoma. Since the numbers patients small study group and this is a Medical college and hospital-based study, it is not appropriate to comment based on this study report.

Correlation of cardiac abnormalities with age, severity of disease and etiology:

Atrial fibrillation was common in even younger patients with hyperthyroidism compare than older patients.80% of patients with atrial fibrillation were age between 30-60 years. In the age group above 60 years, less number of patients (20%) had atrial fibrillation. Atrial fibrillation is significantly more common in younger patients observed in our study.

This study, we observed that patients with severe disease had higher incidence of atrial fibrillation and systolic hypertension. Also it was observed that patients with Grave's disease had severe disease as compared to hyperthyroidism due to other causes. Age and severity of disease were the important cause for AF in hyperthyroidism.

Grave's disease patients had an increase incidence of AF. 80 % cases of atrial fibrillation had Grave's disease. Patients with Grave's disease associated with younger age, have an increased prevalence rate of Atrial fibrillation .In a previous study state that prevalence of atrial fibrillation was only 43% whereas it was only 10% in patients with Graves' disease[51]. Grave's disease patients also had more systolic hypertension as compared to other etiologies. However, Grave's disease patients were of younger age and had more severe disease. Wide pulse pressure was noted more commonly in patients of Grave's disease. Hence this study reflects of severity of disease in Grave's disease patients.

Response to treatment of this study shows:

Therapeutic strategies followed in this study included drugs and surgery. Two patients were expired during the follow up due to refractory cardiac failure. Sixty eight patients were reevaluated after six months.

Table30shows: Cardiac abnormalities before and after treatment:

Cardiac abnormality	**At presentation**	**On follow up**
Palpitation	79%	5%
Tachycardia	66.6%	8%
Atrial fibrillation	17%	2%
Systolic hypertension	49%	3%
Loud S1	29%	2%
Ejection systolic murmur	17%	3%
Pansystolic murmur	11%	2%
Cardiac failure	14.2%	0%
Cardiomegaly	22.2%	16%

At follow up only 4% had cardiac symptoms compared to the 80% on presentation. Edema subsided with treatment in all follow up cases.

With treatment there was significant reduction in cardiac mortality and morbidity. Only one patient had persistent atrial fibrillation on follow up. Patients age above 50 years old and had gross left atrial enlargement. Treatment of hyperthyroidism is frequently associated with reversal of atrial fibrillation to sinus rhythm.

On treatment, there was significant reduction in symptoms and signs of tachycardia, palpitation, atrial fibrillation, systolic hypertension and other cardiac abnormalities. Cardiac failure improved in all the patients with regular treatment and follow up. Left ventricular hypertrophy was persisted in follow up patients with cardiac failure inspite of the regular treatment.

Six patients had mild hyperthyroidism on follow up. There was significant Echocardiogram findings reversal on follow up with treatment. In this study revealed Diastolic dysfunction improvement was shown in patients with hyperthyroidism on early diagnosis, regular treatment and follow up period of six months . Left atrial enlargement persisted in two cases inspite of the regular treatment and follow up.

Table 31 shows: Echo findings before and after treatment shows:

Abnormality	**At Presentation (%)**	**On follow up (%)**
Diastolic dysfunction	29%	8%
Mitral regurgitation	14%	3%
Left ventricular hypertrophy	13%	6%
Pulmonary hypertension	9%	3%
Aortic regurgitation	7.14%	2%
Tricuspid regurgitation	7.14%	2%
Mitral valve prolapse	4.76%	2%

Treatment of hyperthyroidism reversed cardiac symptoms signs observed in majority of study group patients .In a previous study reveals that of 356 patients with cardiac involvement with atrial fibrillation, angina or cardiac failure, over 90% had improvement in cardiac symptoms and signs after adequate treatment[72]

Statistically significant correlation was noted between etiology of hyperthyroidism and treatment outcome. However, the numbers of patients of the study were small to comment on significant conclusions in this study.

Limitations of the study:

This is a Medical college and hospital based study conducted in a tertiary care center and is not so much informative of the patterns of the disease involving in the community. The study population was minimal only seventy cases . Larger community based studies are needed in future to find out the exact incidence and prevalence of cardiac symptoms and signs associated with hyperthyroidism and the clinical epidemiological patterns of hyperthyroidism in our region.

SUMMARY AND CONCLUSIONS:

- Majority of the patients with hyperthyroidism were between 30 and 49 years old (63%). Mean age was 42.08 years. Majority of younger patients with Grave's disease and younger and elderly patients with hyperthyroidism had Multi nodular goiter.

- The patients were observed in this study predominantly females. The male: female ratio was 1:6.

- Palpitation was the most commonest cardiac symptom in hyperthyroidism (79%). Tachycardia (80%) was the most common cardiac sign observed in this study. Atrial fibrillation was noted in 17% of patients.

- The other commonest presenting symptoms were heat intolerance , fatigue, increased appetite and weight loss observed in this study.

- Electrocardiogram abnormalities were noted in three fourth of patients in this study (80%), tachycardia being the commonest sign observed in this study. One fourth (20%) of patents had cardiomegaly and nearly more than half of the patients (56 %) had echocardiographic significant cardiac findings. Hyperthyroidism is one of the commonest risk factor for diastolic dysfunction in young patients noted in this study. Valvular abnormalities also common but rare observed in this study.

Among all the Cardiac valvular abnormalities, Mitral regurgitation and Mitral valve prolapse was the commonest one.

- Grave's disease was the commonest causes of hyperthyroidism, thyrotoxicosis contribute about 60% of cases.
- Atrial fibrillation was common in young and elderly patients with hyperthyroidism noted in this study. 70% of patients with atrial fibrillation were observed in the age of 30- 60 years of age group in this study.
- High Triiodothyronine and low TSH levels correlated well with the presence of atrial fibrillation in this study. High Thyroxine levels and low TSH levels were significantly associated with systolic hypertension.
- Age and severity of the disease are the most important risk factors for atrial fibrillation in hyperthyroidism in this study.
- Patients with Grave's disease had severe disease than hyperthyroidism due to other causes like Multi nodular goiter and toxic adenoma noted in this study.
- Grave's disease patients had a higher prevalence of atrial fibrillation. 80% of patients with atrial fibrillation had Grave's disease.
- Treatment of hyperthyroidism improves the cardiac symptoms and signs in most of the patients observed in this study. There was significant

improvement noted in clinically as well as in the ECG and ECHO findings with treatment. Younger patients with atrial fibrillation had higher chance of reversal to sinus rhythm observed in this study. Cardiac failure improved with treatment in all patients participated in this study group.

- Treatment strategy and etiology of hyperthyroidism definitely have impact on well response to treatment noted in this study group.

PROFORMA

Name Age Sex

Education Occupation

Marital status OP/IP No: DOA:

Duration of symptoms DOD:

Presenting symptoms

Hyper activity

Heat intolerance & sweating

Irritability

Palpitation & chest discomfort

Fatigue

Loss of weight

Excessive appetite

Passing loose stools

Polyuria

Oligomenorrhoea

Loss of libido

Infertility

Impaired concentration

History of fracture

Others if any

Previous Illnesses

Clinical Examination:

General examination

Height	Weight	BMI
Pulse rate	AF +/-	
Blood pressure	Pulse pressure	
Pallor	Icterus	

Skin--- warm / moist

Dermopathy

Pretibial myxedema

Palmar erythema

Urticaria

Hyperpigmentation

Lymphnode

Goitre

Thrill / bruit

Ophthalmopathy

Systemic Examination

CVS

P/A

Respiratory system

CNS hyper reflexia

Muscle wasting

Proximal myopathy

Investigations

LFT

Complete blood picture

Urine routine:

RFT

RBS

Electrolytes

TFT

T3: T4: TSH:

Lipid profile

Sr. Calcium:

Sr. Phosphorus:

ECG:

Chest X-ray:

Echocardiogram:

FNAC Thyroid:

USG Neck:

Any other relevant investigations

Etiology

Treatment given**:**

Follow up after 6 months

Follow up symptoms

HR BP

AF +/-

Systemic Examination

TFT

T3: T4: TSH:

ECG

CXR

Echo:

Sl.no	Patient' Name	Age	Sex	IP NO	Palpitations	Breathlessness	Chestpain	Increaseappetite	Loss of weight	Swelling of neck	Swelling of legs	Tremor	Proximal muscle weakness	Anxiety	Increase bowel movements	Eye signs	Easy fatigability	Oligomenorrhoea	Skin/hair changes	Skin moist/dry	Heatintolernce	Duration(months)	Height incms	WeightinKgs	BMI	Goitre	Bruits	Sleeping PR	Rhythm	Pulsevolume	Character	Vessel wall	B.Pmmofhg	Pulse pressure	JVP	M.R	AF	Other system	HB%in gm%	T3ng/dl	T4mcg/dl	TSH	FT3	FT4	CXR PA view	ECG-Rate	Rhythm	ST-Twave changes	AF/SVT	ECHO-Chamber enlargement	Valvular changes	EF%	Diastolic dysfunction	Diagnosis
1	Valli	40	F	1320450	P	p	P	P	P	P	N	N	N	P	P	N	P	P	N	N	N	8	154	48	20.25	N	N	100	N	N	N	N	130/80	50	N	N	N	N	11.6							100	N	N	N	N	N	52%	N	GD
2	Vijaya	42	F	1320550		p	N	p	p	p	N	p	N	N	N	N	N	N	M	p	6	148	42	21.2	P	P	102	IRR	N	N	N	136/72	58	N	N	N	N	12	228	15	0.1	430	1.88	N	120	IRR	N	AF	N	N	56%	N	GD
3	Geetha	36	F	1321202	P	N	N	N	N	N	N	N	N	N	N	P	P	P	P	N	N	6	152	45	20.6	P	N	90	N	N	N	N	128/8O	48	N	N	N	N	10.5	246	19	0.08	440	2.2	CM	110	N	N	N	N	P	58%	N	MNG
4	sudha	40		1321407	P	N	N	P	P	P	N	P	N	N	N	N	N	N	N	M	N	20	156	46	22.6	P	N	92	N	H	N	N	140/86	64	N	N	N	N	11	236	20	0.09	420	1.6	N	94	N	N	N	N	N	54%	N	GD
5	Uma	18	F	1322567	P	N	N	N	P	N	N	N	N	P	N	N	N	N	N	P	N	12	160	52	23.4	N	N	96	N	N	N	N	150/84	66	R	P	N	N	12	212	24	0.06	416	1.8	CM	96	N	N	N	N	N	52%	N	GD
6	Lakshmi	39	F	1322834	P	N	N	N	P	P	N	P	N	N	P	N	P	P	P	M	N	12	164	47	21.8	P	P	100	N	N	N	N	150/92	58	N	N	N	N	11	198	22	0.2	423	2	N	106	IRR	N	AF	P	P	48%	P	MNG
7	Kamatchi	52	F	1323783	P	N	P	N	N	P	N	N	N	N	N	N	N	N	N	N	N	8	173	48	20.9	P	N	88	N	N	N	N	160/96	64	R	N	N	N	9.5	210	18	0.04	410	2.2	N	108	N	ST	N	N	N	46%	P	GD
8	somu	40	M	1324356		P	N	N	N	P	P	N	P	N	N	P	N	N	M	N	6	162	50	23.4	N	N	102	IRR	N	N	THICK	170/108	62	N	N	P	ABN	10	310	16.5	0.06	412	1.8	N	112	IRR	N	AF	P	N	56%	N	GD
9	Selvi	42	F	1324902	P	N	N	P	N	P	N	P	N	N	N	N	N	N	N	P	7	146	51	22.8	P	N	104	N	H	N	N	150/80	70	N	P	N	N	11	432	17.5	0.08	402	2.2	CM	128	N	N	N	N	N	54%	N	MNG
10	Vasuki	30	F	1325197	P	N	N	N	N	P	N	N	N	N	N	N	P	P	M	N	9	150	52	19.8	N	N	90	N	N	N	N	140/82	58	N	N	N	N	12	380	21	0.04	403	2.82	N	112	N	N	N	N	N	54%	N	GD
11	Devika	33	F	1325265	P	P	P	P	P	P	N	P	N	P	P	P	N	N	N	N	6	148	49	19.4	P	N	100	N	N	N	N	156/94	62	R	N	P	N	13	440	19.2	0.02	443	1.96	N	98	N	N	N	N	N	44%	P	GD
12	Radhika	37	F	1325467	P	N	N	N	N	N	N	N	N	N	N	N	N	N	N	P	12	154	44	20.8	N	N	94	N	N	N	N	142/86	56	N	N	N	N	14	420	18.5	0.05	462	1.98	N	96	IRR	N	AF	P	P	61%	N	MNG
13	Dhanalakshmi	44	F	1325786	P	N	N	P	P	P	N	P	P	P	N	N	N	N	N	M	N	10	144	41	19.8	P	P	96	N	H	N	N	150/90	60	N	N	N	N	10	412	20	0.04	456	2.2	CM	94	N	N	N	N	N	45%	P	GD
14	Gayathri	26	F	1326101	P	P	P	N	P	P	N	N	N	N	N	N	N	N	N	N	4	152	54	20.6	N	N	98	N	N	N	N	170/104	66	N	N	N	N	9	330	22	0.02	423	2.4	N	88	IRR	N	N	N	N	55%	N	MNG
15	Akila	39	F	1326308	P	N	N	N	N	P	P	P	N	P	P	P	P	N	P	M	N	5	164	48	21.6	P	N	86	N	N	N	N	146/82	64	R	N	N	N	8	280	24	0.09	472	2.32	N	106	N	N	N	N	N	53%	N	GD
16	Jeyanthi	31	F	1326709	P	N	N	P	P	N	N	N	N	N	N	N	N	N	N	N	6	147	46	19.8	N	N	102	N	H	N	N	160/104	54	N	N	N	N	10	360	22	0.06	480	2	CM	102	IRR	N	AF	N	P	54%	N	GD
17	Reguna	19	F	1327009	P	P	N	P	P	P	N	P	N	N	N	N	P	P	M	N	6	145	47	18.8	P	N	106	IRR	N	IRR	N	170/120	50	N	P	P	ABN	9.2	340	23.5	0.09	468	1.84	N	104	IRR	ST	N	N	N	58%	N	MNG
18	Mariammal	54	F	1327187	P	N	N	N	N	P	N	P	N	P	N	N	N	N	N	P	12	161	51	20.6	N	N	90	N	N	N	N	180/118	62	N	N	P	N	8.8	312	20	0.3	458	1.92	N	100	N	N	N	N	N	54%	N	GD
19	selvarani	42	F	1327386		N	N	P	P	N	N	N	N	N	P	N	N	N	M	N	11	160	50	21.8	P	N	92	N	N	N	N	170/110	60	N	P	N	N	9.2	417	21	0.04	486	1.86	N	98	N	N	N	N	N	52%	N	MNG
20	Geetha	28	F	1328079	P	P	P	P	P	P	N	P	N	N	N	P	P	N	P	N	12	150	45	20.4	N	N	94	N	H	N	N	140/86	54	N	N	N	N	9.6	425	16.7	0.07	486	1.85	CM	96	N	N	N	N	N	58%	N	SN
21	Selvam	42	M	1328111	P	N	N	N	N	P	P	N	N	P	P	N	N	N	M	N	7	172	46	22.4	p	P	96	N	N	N	N	150/96	54	R	N	N	N	10.8	432	18.4	0.06	444	2.2	N	116	IRR	N	AF	P	P	48%	P	GD
22	kathirvel	56	M	1328514		N	N	N	N	P	N	P	N	N	N	P	N	N	N	N	P	8	149	60	21.8	N	N	100	N	H	N	N	160/104	56	N	N	N	N	11	467	19	0.04	452	2.6	N	104	N	N	N	N	N	50%	N	GD
23	Sathya	43	F	1328712	P	p	P	P	P	P	N	N	N	P	N	N	P	P	P	M	N	6	148	58	22.4	P	N	98	N	N	N	N	160/100	60	R	N	N	N	10	322	20	0.06	428	1.76	N	108	IRR	N	N	N	N	52%	N	MNG
24	Rengammal	52	F	1329007	P	N	N	P	P	N	N	P	N	N	N	N	N		N	N	N	9	153	48	21.6	N	N	102	N	H	N	N	130/82	48	N	N	N	N	12	352	21	0.05	456	1.68	N	116	N	N	N	N	N	60%	N	GD
25	Muthulakshmi	38	F	1329516	P	N	N	N	N	P	N	N	N	P	P	P	P	N	N	M	N	10	152	54	21.8	P	N	96	N	N	N	N	150/104	46	R	P	N	N	13	510	21.5	0.01	442	2.3	N	120	IRR	ST	AF	N	N	54%	N	GD
26	Veerama	62	F	1330189	P	P	P	P	P	P	N	P	P	N	N	N	N	N	N	N	12	154	46	22.6	N	N	100	N	H	N	N	152/100	52	N	N	N	N	12	342	16	0.02	440	2.5	N	114	N	N	N	N	N	52%	N	MNG
27	Angammal	65	F	1331213	P	N	N	P	P	P	N	N	N	P	N	N	N	N	M	N	8	146	44	19.6	P	N	102	N	N	N	N	170/114	56	N	N	N	N	13	296	17	0.02	421	2.1	N	118	IRR	N	AF	N	N	56%	N	SN
28	Meenakshi	47	F	1332796	P	N	N	N	N	N	N	P	N	N	N	P	P	N	P	N	P	6	148	46	19.2	N	N	105	IRR	N	IRR	THICK	150/96	54	N	N	P	N	14	386	18	0.03	426	2.3	N	96	N	N	N	N	N	42%	P	GD
29	Kamalambal	62	F	1333465	P	N	N	N	P	P	P	N	N	N	N	N	N	N	M	N	6	153	50	21.6	N	N	90	N	N	N	N	160/102	58	N	N	N	N	10	388	20	0.03	432	2.2	CM	108	IRR	N	AF	N	P	48%	P	GD
30	karthika	29	F	1333902	P	P	P	P	P	P	N	N	P	N	P	P	P	N	N	M	N	8	143	52	21.6	P	P	92	N	N	N	N	170/110	60	N	P	N	N	12	402	16.3	0.02	452	1.88	N	98	N	N	N	N	N	52%	N	MNG
31	Maheswari	38	F	1334532	P	P	N	N	N	P	N	N	N	N	N	N	P	P	M	N	8	153	60	22.6	N	N	94	N	N	N	N	130/68	62	R	N	N	N	11	428	17.8	0.01	478	1.67	N	108	N	N	N	N	N	49%	P	GD
32	Amsavalli	48	F	1335209	P	N	N	P	P	N	P	P	N	N	N	P	N		N	N	P	7	151	62	21.8	P	N	96	N	H	N	N	120/68	52	N	N	N	N	12	376	20	0.02	450	1.86	N	110	N	ST	N	N	N	50%	N	GD
33	Saranya	31	F	1336882		N	N	P	N	N	N	N	N	P	P	N	P	N	N	M	N	7	148	56	22	N	N	98	N	N	N	N	140/86	54	N	N	P	N	9.5	350	21	0.02	468	1.86	CM	100	N	N	N	N	P	54%	N	MNG
34	Shobana	36	F	1337381	P	N	N	N	P	P	N	N	N	N	N	N	N	N	N	N	12	156	54	23.2	P	P	100	N	N	N	N	130/76	54	N	N	N	N	11	334	22	0.04	438	2.22	N	116	IRR	N	AF	P	N	52%	N	GD
35	Sumathi	39	F	1337846	P	P	P	N	N	P	N	N	N	N	N	P	N	N	M	N	10	153	52	22.4	N	N	102	N	N	N	N	130/70	60	N	N	N	N	10	434	24	0.02	430	2.6	N	102	N	N	N	N	N	50%	N	GD
36	Chellapan	53	M	1338145	P	N	N	P	P	N	N	P	N	P	P	N	P	P	P	M	N	11	152	50	23.6	P	N	98	N	N	N	N	150/92	62	R	P	N	ABN	8.6	412	20	0.04	426	2.2	N	104	IRR	N	AF	N	N	52%	N	MNG
37	Rajakumari	32	F	1338499		N	N	N	N	P	P	N	N	N	N	N	N	N	N	P	12	158	48	24.2	N	N	94	N	N	N	N	154/100	54	N	N	N	N	12	454	19	0.06	460	2.1	CM	92	N	N	N	N	N	54%	N	GD
38	Veni	41	F	1339121	P	N	N	N	N	P	N	P	N	N	N	P	N	N	M	N	5	162	52	22.4	P	P	96	N	N	N	N	132/80	52	N	N	P	N	12.5	346	18	0.03	480	1.66	N	90	N	N	N	N	N	48%	P	GD
39	Rekha	39	F	1340221	P	P	P	P	P	P	N	N	N	P	P	N	P	N	P	N	N	4	164	50	23.6	N	N	100	N	H	N	N	128/80	48	N	N	N	N	13	510	17	0.02	426	1.72	N	100	IRR	N	AF	N	N	52%	N	MNG
40	Hema	33	F	1341627	P	N	N	N	N	N	P	N	N	N	N	N	N	N	M	N	3	154	48	22.4	N	N	98	N	N	N	N	150/90	60	N	N	N	N	13.2	520	16.8	0.04	464	1.8	N	96	N	ST	N	N	N	45%	P	GD
41	Saroja	52	F	1342555	P	N	N	P	P	P	N	N	N	P	N	P	N	N	N	P	6	144	51	21.8	P	N	102	N	N	N	N	144/92	52	N	N	N	N	14	324	18	0.02	452	2.2	N	94	N	N	N	N	N	46%	P	GD
42	Nasrin fathima	28	F	1343689		P	P	N	N	P	N	P	N	N	N	N	P	P	M	N	7	149	49	20.6	N	N	96	N	H	N	N	130/76	54	N	N	N	N	12	346	19	0.04	476	2.3	N	92	IRR	N	AF	P	P	52%	N	GD
43	Govidammal	60	F	1344244	P	N	N	N	N	N	P	N	N	P	P	P	N	N	M	N	7	148	48	20.4	P	P	98	N	N	N	N	120/64	56	N	N	N	N	11	356	19	0.02	380	2.1	N	88	N	N	N	N	N	54%	N	MNG
44	Mala	42	F	1344029		N	N	P	P	P	N	P	N	N	N	N	N	N	N	N	8	150	50	23.2	N	N	88	N	N	N	N	166/104	62	N	P	P	N	12.4	364	20	0.04	390	2	N	90	N	N	N	N	N	52%	N	GD
45	Nagammal	37	F	1344447	P	P	N	N	N	P	N	P	N	N	N	N	N	N	N	P	12	151	46	24.4	P	N	100	N	H	N	N	160/94	66	N	N	N	N	10	292	21	0.03	400	2.1	N	102	IRR	N	N	N	N	42%	P	MNG
46	Ilakkaiyan	47	M	1345351	P	N	N	P	P	P	N	N	N	P	N	P	N	N	M	N	12	154	44	22.2	N	N	102	N	N	N	N	140/76	64	N	N	N	N	10.8	298	22	0.02	404	2.2	N	104	N	N	N	N	N	40%	P	GD
47	Pushpavalli	38	F	1346761	P	N	N	N	N	N	N	P	N	N	N	P	P	P	M	N	10	166	47	21.6	P	N	98	N	N	N	N	150/82	68	N	N	N	N	11	344	23	0.01	462	2.4	N	106	N	N	N	N	P	47%	N	GD
48	Tamilmani	36	F	1347625	P	P	P	P	P	P	P	N	N	P	N	N	N	N	N	P	9	166	45	22.2	N	N	96	N	N	N	N	162/100	62	N	N	N	N	12	326	21	0.02	452	2.6	N	108	N	N	N	N	P	54%	N	MNG
49	murugeswari	71	F	1348745	P	N	N	N	N	P	N	P	N	N	P	P	N	N	N	M	N	8	159	52	22.6	P	N	94	N	H	N	N	150/86	64	N	N	P	N	12	336	20	0.03	428	2.8	CM	102	N	ST	N	N	N	60%	N	GD
50	Muthambal	66	F	1349412	P	N	N	N	N	P	N	N	N	P	N	N	N	P	N	N	N	6	148	47	21.6	N	N	92	N	N	N	N	170/108	62	N	N	N	N	11	342	18	0.02	432	2	N	104	N	N	N	N	P	54%	N	MNG
51	Subbaiyan	60	M	1350502		P	P	P	P	P	N	P	N	N	N	N	P	N	N	M	N	9	152	50	21.6	N	N	96	N	N	N	N	170/110	60	N	N	N	N	12	286	19	0.08	480	1.9	N	98	N	N	N	N	N	52%	N	MNG
52	Lakshmanan	48	M	1351321	P	N	N	N	N	P	N	N	N	P	N	P	N	N	N	M	N	12	154	51	22.4	P	P	94	N	N	N	N	130/68	62	N	P	N	N	10.6	268	21	0.09	482	1.96	CM	96	N	N	N	N	N	52%	N	GD
53	Maruthambal	56	F	1352908	P	N	N	N	N	N	N	P	P	N	N	P	P	P	P	M	N	10	148	53	21.6	N	N	96	N	H	N	N	130/66	64	R	N	N	N	11.4	320	20	0.04	490	1.98	N	94	N	N	N	N	P	54%	N	GD
54	Chinnaponnu	72	F	1353706	P	N	P	P	P	P	N	N	N	P	N	N	N	N	N	P	9	154	54	23.8	P	N	98	N	N	N	N	144/88	56	N	N	N	N	12	350	21	0.02	496	1.93	N	102	IRR	N	N	N	N	58%	N	MNG
55	Rani	42	F	1354487	P	P	N	N	P	P	N	P	N	N	N	P	N	N	M	N	8	156	54	22.2	N	N	100	IRR	N	IRR	THICK	140/82	58	N	N	P	ABN	11	420	18	0.02	470	1.98	N	104	N	N	N	N	N	44%	P	GD
56	Noorjahan	31	F	1355854	P	N	N	N	N	N	N	N	P	N	N	N	N	N	N	N	7	158	48	21.8	P	N	96	N	N	N	N	150/90	60	N	N	N	N	12	410	19	0.01	463	2.2	N	116	IRR	N	AF	P	P	46%	P	MNG
57	Boopathy	44	F	1356332	P	N	N	P	P	P	N	P	N	N	P	P	P	P	P	M	N	12	160	47	22.8	N	N	98	N	N	N	N	140/74	66	N	N	N	N	13	380	17	0.02	468	2.1	CM	120	N	N	N	N	N	42%	P	GD
58	Mynavathy	34	F	1357477	P	P	P	N	N	P	P	N	N	P	N	N	N	N	N	N	P	6	164	46	24.6	P	P	90	N	H	N	N	150/88	62	N	N	N	N	10.5	344	16.5	0.02	478	2.2	N	108	N	N	N	N	N	48%	N	MNG
59	Elamathy	27	F	1358003	P	N	N	P	P	P	P	N	P	N	N	N	N	N	M	N	8	156	44	20.8	N	N	92	N	N	N	N	140/76	64	N	P	N	N	12	356	17.2	0.03	448	2.2	N	106	N	N	N	N	N	53%	N	GD
60	Kowsalya	35	F	1359921	P	N	N	N	N	P	N	P	N	N	P	N	N	P	N	M	N	9	154	46	22.8	P	N	94	N	N	N	N	120/72	48	N	P	N	P	11	324	18	0.04	492	2.2	CM	120	IRR	N	AF	P	P	56%	N	GD
61	Suseela	50	F	1360212	P	P	P	P	P	P	N	N	N	N	N	P	N	N	N	N	12	152	50	23.4	N	N	96	N	H	N	N	130/78	52	R	N	N	N	10	346	17.4	0.01	482	2.3	N	90	N	N	N	N	N	52%	N	MNG
62	Ramasamy	50	M	1361817	P	N	N	N	N	N	N	N	P	N	N	N	P	P	N	P	M	N	14	144	51	22.6	N	N	98	N	N	N	N	136/78	54	N	N	N	N	12	338	18	0.01	469	2.4	CM	110	IRR	N	N	N	N	42%	P	GD
63	Vimala	35	F	1362346	P	N	N	P	P	P	P	N	N	N	N	N	N	N	N	N	P	15	148	53	22.8	P	N	100	N	N	N	N	140/84	56	N	N	N	N	11	432	19	0.02	456	2.6	N	98	N	N	N	N	N	58%	N	MNG
64	Sundari	32	F	1363796		P	P	N	N	P	N	P	N	N	N	N	N	p	N	M	N	9	149	52	20.6	N	N	98	N	N	N	N	134/80	54	N	P	N	N	10.5	426	20	0.01	467	2.8	N	96	N	ST	N	P	P	58%	N	SN
65	Kaliyamoorthy	72	M	1364664	P	P	N	P	P	P	N	N	N	N	P	P	P	N	N	N	8	150	40	20.8	P	N	96	N	N	N	N	150/88	62	N	P	P	N	11	392	18.6	0.02	425	1.92	N	94	N	N	N	N	N	46%	P	GD
66	Sasikala	32	F	1365722	P	N	N	P	N	P	N	P	N	N	N	P	N	N	M	N	6	152	42	21.8	N	N	96	N	H	N	N	160/96	64	N	P	N	N	12	292	17.6	0.01	467	1.98	N	102	IRR	N	N	N	N	52%	N	MNG
67	Sakthivel	40	M	1366432		N	N	N	P	N	N	N	N	N	N	N	N	N	N	P	10	148	43	21.6	P	P	98	N	N	N	N	170/104	66	N	P	N	N	12	345	18	0.02	432	2	N	94	N	N	N	N	P	44%	P	GD
68	Revathy	41	F	1367906	P	P	P	P	P	P	N	P	N	P	P	P	P	p	N	M	N	12	146	50	20.6	N	N	98	N	N	N	N	150/82	68	N	N	N	N	13	344	20	0.1	496	1.76	N	96	N	N	N	N	N	48%	P	MNG
69	Shobana	43	F	1368705	P	N	N	P	N	N	P	N	N	N	N	N	N	N	N	M	N	6	142	51	21.6	P	N	96	N	H	N	N	160/94	66	N	N	N	N	12	320	20	0.02	428	2.2	N	100	N	N	N	N	N	52%	N	GD
70	Menaka	28	F	1370245	P	N	N	P	P	P	N	N	N	P	P	P	P	N	P	M	P	6	154	46	22.4	N	N	98	N	N	N	N	124/6020.25	64	N	N	N	N	12	340	21	0.03	438	2.4	N	102	N	N	N	N	N	50%	N	GD

KEY TO MASTER CHART

ABN-Abnormal

AF- Atrial fibrillation

AR- Aortic regurgitation

BP- Blood Pressure

BMI- Body mass index

CCF – Congestive Cardiac Failure

CM- Cardiomegaly

Col.Nod- Colloid nodule

CVS-Cardio vascular system

CNS- Central nervous system

CF- Cardiac failure

D- DE diffuse enlargement

D - Digoxin

DD- Diastolic dysfunction

DI- Diarrhea

ECG – Electrocardiogram

ECHO - Echocardiogram

EDM- Early diastolic murmur

ESM- Ejection systolic murmur

E- Exophthalmos

FT3 –Free T3

FT4 –Free T4

FNAC – Fine needle Aspiration Cytology

FC- Follicular cells

F - Fatigue

GD- Grave's disease

HR- Heart rate

H - Heat intolerance

Hy -Hyper reflexia

KI-Potassium iodide

LAE-Left Atrial enlargement

LI- Lymphocytic infiltrates

LV – Left ventricle

LVH- Left ventricular hypertrophy

LFT- Liver function test

MVP – Mitral valve Prolapse

MNG- Multinodular goiter

MR- Mitral regurgitation

NSR – Normal Sinus Rhythm

N- No

NO- Normal

NE –Carbimazole

OPD – Out Patient Department

O- Oedema

OL - Oligomenorrhea

P/A- Per Abdomen

PSM - Pansystolic murmur

PAH -Pulmonary hypertension

PP- Periodic paralysis

P -Present

PM - Proximal myopathy

PT – Propylthiouracil

RBS- Random blood sugar

RFT- Renal function test

R- Retrosternal goiter

SA node-Sino Atrial node

SHT – Systemic Hypertension

SN- Solitary nodule

S- Surgery

S1- Loud S1

SVT – Supraventricular Tachyarrhythmia

SVR – Systemic vascular resistance

T3/T4 - Thyroid hormones

T3 – Triiodothyronine

T4 – Thyroxine

TSH – Thyroid Stimulating Hormone

TFT – Thyroid Function Test

T - Tremor

TA- tachycardia

TR- Tricuspid regurgitation

WPP-Wide Pulse Pressure

W - Weight loss

Y -Yes.

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1 INTRODUCTION: Thyroid means (Greek thyreos means Shield, plus eidos, form) Thyroid disorders is the commonest endocrinological disorder in clinical practice after diabetes mellitus. Hyperthyroidism is defined in a state of excessive thyroid gland function. Thyrotoxicosis is defined as the state of thyroid hormone excess and causes clinical Cardiac, Neurological, Ophthalmological , Dermatological, Gastro- intestinal , Endocrinological symptoms and signs. Hyperthyroidism caused by Grave's disease, Multi nodular goiter and Toxic adenomas constitute about majority of the cases of thyrotoxicosis. Grave's disease accounts for about 60-80% cases of thyrotoxicosis 1 . Thyroid hormone exerts wide...

STUDY OF CARDIOVASCULAR MANIFESTATIONS IN

BY RAJASEKAR 20101179 M.D. GENERAL MEDICINE

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Hyperthyroidism causes a wide range of clinical manifestations signs and